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installation, start-up and service instructions

SINGLE PACKAGE ROOFTOP GAS HEATING/ELECTRIC COOLING UNITS

587A
**Sizes 018-060
1-1/2 to 5 Tons**

Cancels: II 587A-18-1

 II 587A-18-2
9/1/92

IMPORTANT — READ BEFORE INSTALLING

1. Read and become familiar with these installation instructions before installing this unit (Fig. 1).
2. Be sure the installation conforms to all applicable local and national codes.
3. These instructions contain important information for the proper maintenance and repair of this equipment. Retain these instructions for future use.

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SAFETY CONSIDERATIONS

⚠ WARNING: Improper installation, adjustment, alteration, service, maintenance or use can cause carbon monoxide poisoning, explosion, fire, electric shock or other occurrences which may injure you or damage your property. Consult a qualified installer, service agency or the gas supplier for information or assistance. The qualified installer or agency must use only factory authorized kits or accessories when modifying this product.

Recognize safety information. This is the safety-alert symbol (⚠). When you see this symbol on the unit and in instructions or manuals, be alert to the potential for personal injury.

Understand the signal words — DANGER, WARNING and CAUTION. These words are used with the safety-alert symbol. Danger identifies the most serious hazards which will result in severe personal injury or death. Warning indicates a condition that could result in personal injury. Caution is used to identify unsafe practices which would result in minor personal injury or product and property damage.

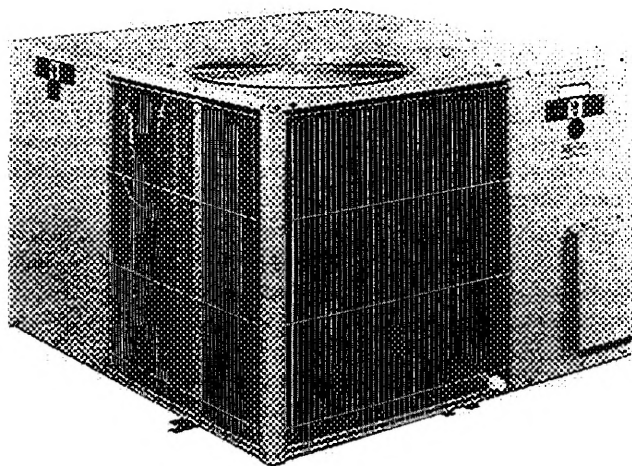


Fig. 1 — Typical 587A Small-Cabinet Unit (018-042)

⚠ WARNING: Disconnect gas piping from unit when leak testing at pressure greater than 1/2 psig. Pressures greater than 1/2 psig will cause gas valve damage resulting in hazardous condition. If gas valve is subject to pressure greater than 1/2 psig, it must be replaced before use. When pressure testing field-supplied gas piping at pressures of 1/2 psig or less, a unit connected to such piping must be isolated by manually closing the gas valve(s).

⚠ WARNING: Before performing service or maintenance operations on unit, turn off gas supply then main power switch to unit. Electrical shock could cause personal injury.

1. The power supply (v, ph and Hz) must correspond to that specified on unit rating plate.
2. The electrical supply provided by the utility must be sufficient to handle load imposed by this unit.
3. Refer to Locate the Unit section and Fig. 2-4 (pages 2-4) for locations of gas inlet, electrical inlets, condensate drain, duct connections and required clearances before setting unit in place. See Table 1 for unit physical data.
4. Locate the unit where the vent cap will be a minimum of 4 ft from openable windows or doors.
5. This installation must conform with local building codes and with the National Fuel Gas Code (NFPA), American National Standards Institute (ANSI) Z223.1-1988 (in Canada, CAN/CGA [Canadian Gas Association] B149.1, [2]-M86) or NFPA (National Fire Protection Association) 54-1988 TIA-54-84-1. Refer to Provincial and local plumbing or wastewater codes and other applicable local codes.
6. Approved for outdoor installation on wood flooring or on class A, B or C roof covering materials.

INSTALLATION

Unit sizes 018-042 are shipped in the downflow configuration. To convert to horizontal discharge, remove horizontal duct opening covers. Using the same screws, install covers with insulation side up (facing inside) on the unit on downflow duct openings. Seals around duct openings must be tight. Unit sizes 048 and 060 are shipped with all 4 duct openings covered. Remove appropriate panels for intended installation.

Model 587A meets the California maximum oxides of nitrogen (NO_x) emission regulations.

These units are equipped with an energy-saving, automatic, electric, intermittent spark ignition system that does not have a continuously burning pilot. All units are manufactured with natural gas controls.

These units are designed for a minimum continuous return-air temperature of 60 F (dry bulb) or an intermittent operation down to 55 F (dry bulb), such as when used with a night setback thermostat.

All units can be connected into existing duct systems *that are sized properly and designed to handle an airflow of 350 to 450 cfm for each 12,000 Btuh of rated cooling capacity.*

NOTE: When installing any accessory item, see the manufacturer's installation instructions packaged with the accessory. A qualified agency must use factory-authorized kits or accessories when modifying this unit.

I. LOCATE THE UNIT

A. Clearance

Maintain clearance around and above unit to provide minimum distance from combustible materials, proper airflow and service access. See Fig. 2-4.

CAUTION: Do not restrict condenser airflow. An air restriction at either the condenser-air inlet (the entire surface of the condenser coil) or the fan discharge can be detrimental to compressor life.

The condenser fan discharges through the top of the unit. Ensure that the fan discharge does not recirculate to the condenser coil. Do not locate the unit either in a corner or under a complete overhead obstruction and ensure the following clearances are provided:

On roof overhangs, provide a minimum clearance of 48 in. above the top of the unit for partial overhangs (such as a normal house roof overhang). If there is a horizontal extension on the partial overhang, it must not exceed 48 inches. For extended overhangs, provide a minimum clearance of 36 inches.

Provide a minimum clearance of 42 in. for the control box side next to a block wall or any other grounded surface. Provide a minimum clearance of 48 in. between the control box side of the unit and any electrically live parts, for example, another unit. Provide a minimum clearance of 36 in. for the accessory manual outdoor-air damper or economizer (if the unit is equipped with one). The clearance for under the unit is zero inches.

Minimum operating clearance to combustibles is 30 in. on all sides except duct side.

Do not install unit in an indoor location. Do not locate unit air inlets near exhaust vents or other sources of contaminated air.

Be sure that unit is installed so that snow will not block the combustion intake or flue outlet.

Although unit is weatherproof, guard against water from higher level runoff and overhangs.

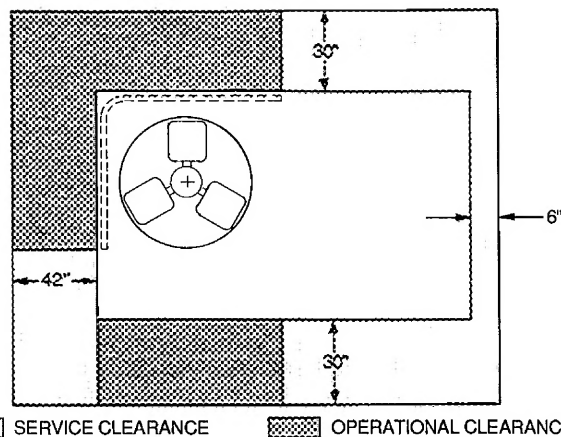


Fig. 2 — Service and Operational Clearances

Slab-mounted units should be at least 4 in. above the highest expected water level, flood and runoff. Do not use the unit if it has been under water.

Locate mechanical draft system flue assembly at least 48 in. from any opening through which combustion products could enter the building, and at least 30 in. from an adjacent building. When unit is located adjacent to public walkways, flue assembly must be at least 7 ft above grade.

Flue gas can deteriorate building materials. Orient unit so that flue gas will not affect building materials.

Adequate combustion-air space must be provided for proper operation of this equipment. Be sure that installation complies with all local codes.

Flue vent discharge must have a minimum horizontal clearance of 4 ft from electric meters, gas meters, gas regulators and gas relief equipment.

B. Rooftop Installation

CAUTION: When installing the unit on a rooftop, be sure that the roof will support the additional weight. Refer to Fig. 3 and 4 for total weight and corner weight information. Refer to Fig. 5 and 6 for roof curb dimensions.

For downflow applications, an accessory roof curb must be installed on, and flashed into, the roof before unit installation. Install insulation, cant strips, flashing and gasket material per accessory roof curb installation instructions. The placement of the gasket material between the unit and roof curb is critical for water integrity. The curb should be level to within 1/4 inch. Unit leveling tolerances are shown in Fig. 7.

For horizontal applications, place the unit on a level base that provides proper support. On flat roofs, be sure that the unit is located at least 4 in. above the highest expected water level on the roof to prevent flooding.

C. Ground-Level Installation

Place the unit on a solid, level, concrete pad that is a minimum of 4-in. thick with 2 in. above grade. The pad should extend approximately 2 in. beyond the casing on all 4 sides of the unit. Install a gravel apron in front of condenser-air inlets to prevent obstruction of airflow by grass, shrubs, etc. Do not secure the unit to the pad *except* when required by local codes.

NOTE: Horizontal units may be installed on a roof curb if required.

II. UNIT DUCT CONNECTIONS

On downflow units, secure all ducts to roof curb and building structure. On horizontal units, all ductwork should be secured to flanges.

(text continued on page 7)

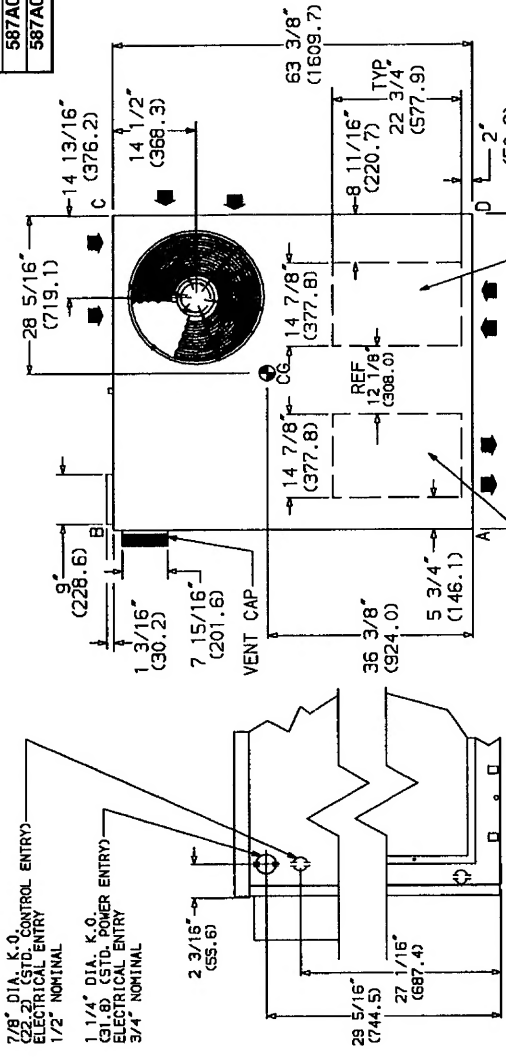
REQ'D CLEARANCES FOR SERVICING, IN.
(mm)

Blower Access Panel Side	30 (762.0)
Control Box Access Side	30 (762.0)

REQ'D CLEARANCES TO COMBUSTIBLE MATL., IN. (mm)

Maximum Extension of Overhang	48 (1219.2)
Unit Top	36 (914.4)
Duct Side of Unit	6 min. (152.4 min.)
Side Opposite Ducts	30 (762.0)
Bottom of Unit	0

NOTE: Clearances must be maintained to prevent recirculation of air from outdoor fan discharge.



UNIT	ELECTRICAL CHARACTERISTICS	UNIT WT.		CORNER WT. Lb./Kg		
		Lbs.	Kg.	A	B	D
587A048080	208/230-1-60	489	222	104/47	142/64	139/63
587A048100	208/230-1-60	495	225	105/48	144/65	140/64
587A048120	208/230-1-60	501	227	106/48	146/66	142/64
587A060080	208/230-1-60	498	226	106/48	144/65	141/64
587A060100	208/230-1-60	504	229	106/48	145/66	144/65
587A060120	208/230-1-60	510	231	109/49	147/67	145/65

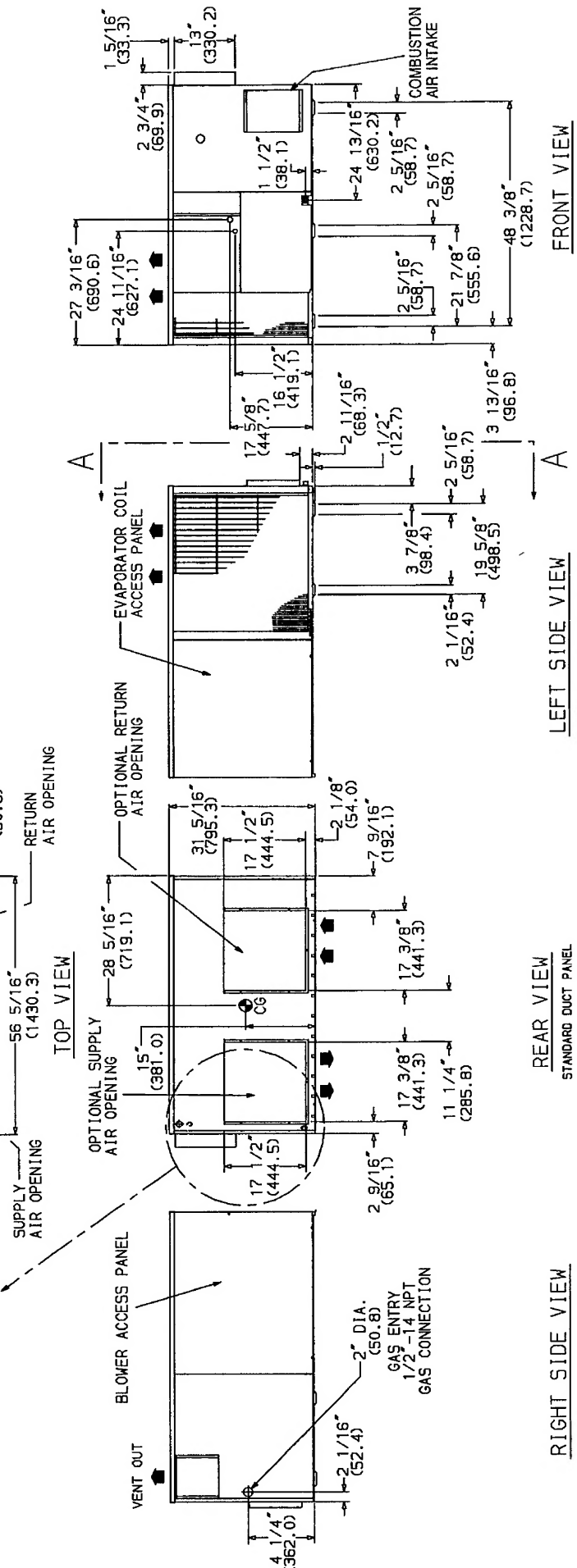
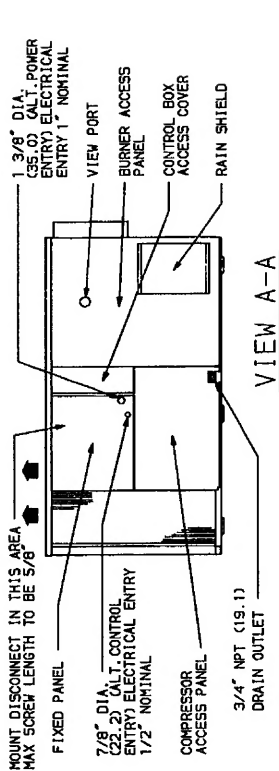
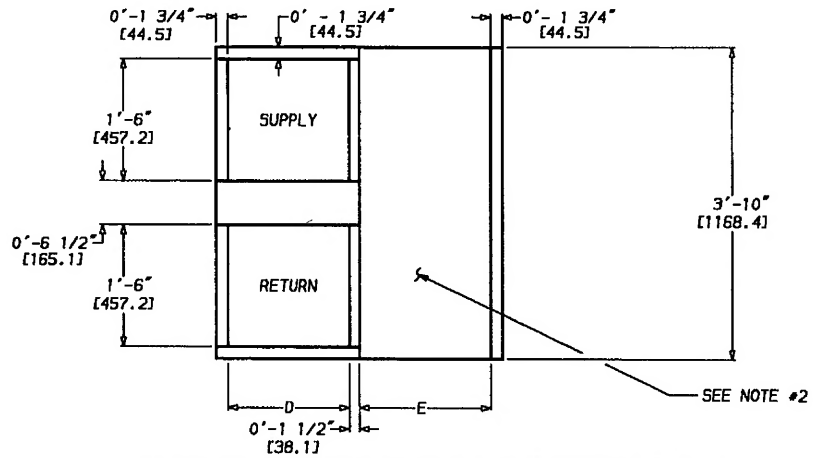


Fig. 4 — 587A Large-Cabinet Unit Dimensions

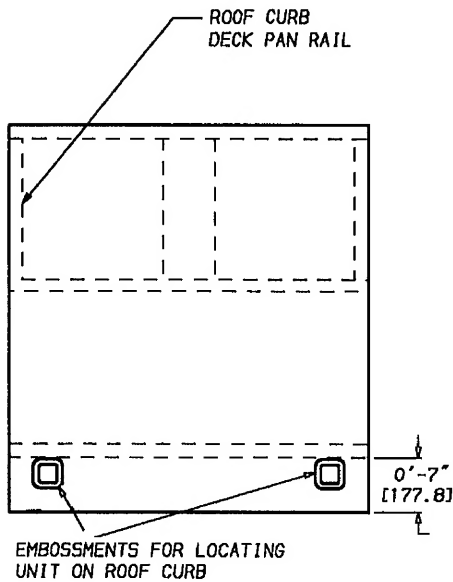
UNIT SIZE	CURB	CURB P/N	A	B	C	D	E	F	ROOF PITCH
587A018040- 587A042096	Flat	389049-701	3'-6½" [1079.5]	0'- 8" [203.2]	—	1'-6" [457.2]	1'-7½" [495.3]	—	—
		389049-702		0'-11" [279.4]					
		389049-703		1'- 2" [355.6]					
	Pitched (See Note 1)	389050-701	3'-6½" [1079.5]	0'- 9¼" [235]	—	1'-6" [457.2]	1'-7½" [495.3]	—	1: 12
		389050-702		1'-½" [317.5]					2: 12
		389050-703		1'- 3¾" [400]					3: 12
		389050-704		1'- 7" [482.6]					4: 12
		389050-705		1'-10½" [571.5]					5: 12
		389050-706		2'- 1¼" [654.1]					6: 12

NOTES:

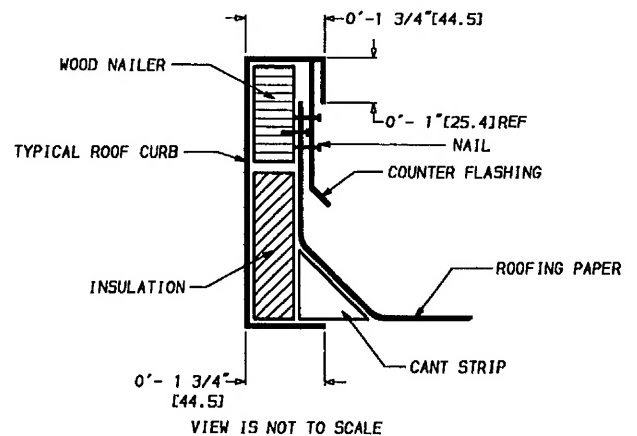
1. Completed specification sheet must accompany pitched curb order. Contact order correspondent or product manager for specification forms.
2. This area of the roof curb slopes slightly to the right for drainage purpose.



TOP VIEW IS TYPICAL FOR FLAT ROOF CURBS AND PITCHED ROOF CURBS



CABINET UNIT POSITIONED ON ROOF CURB



VIEW IS NOT TO SCALE

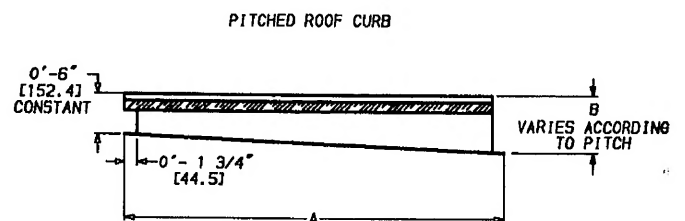
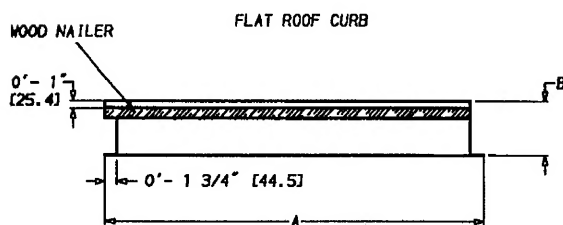
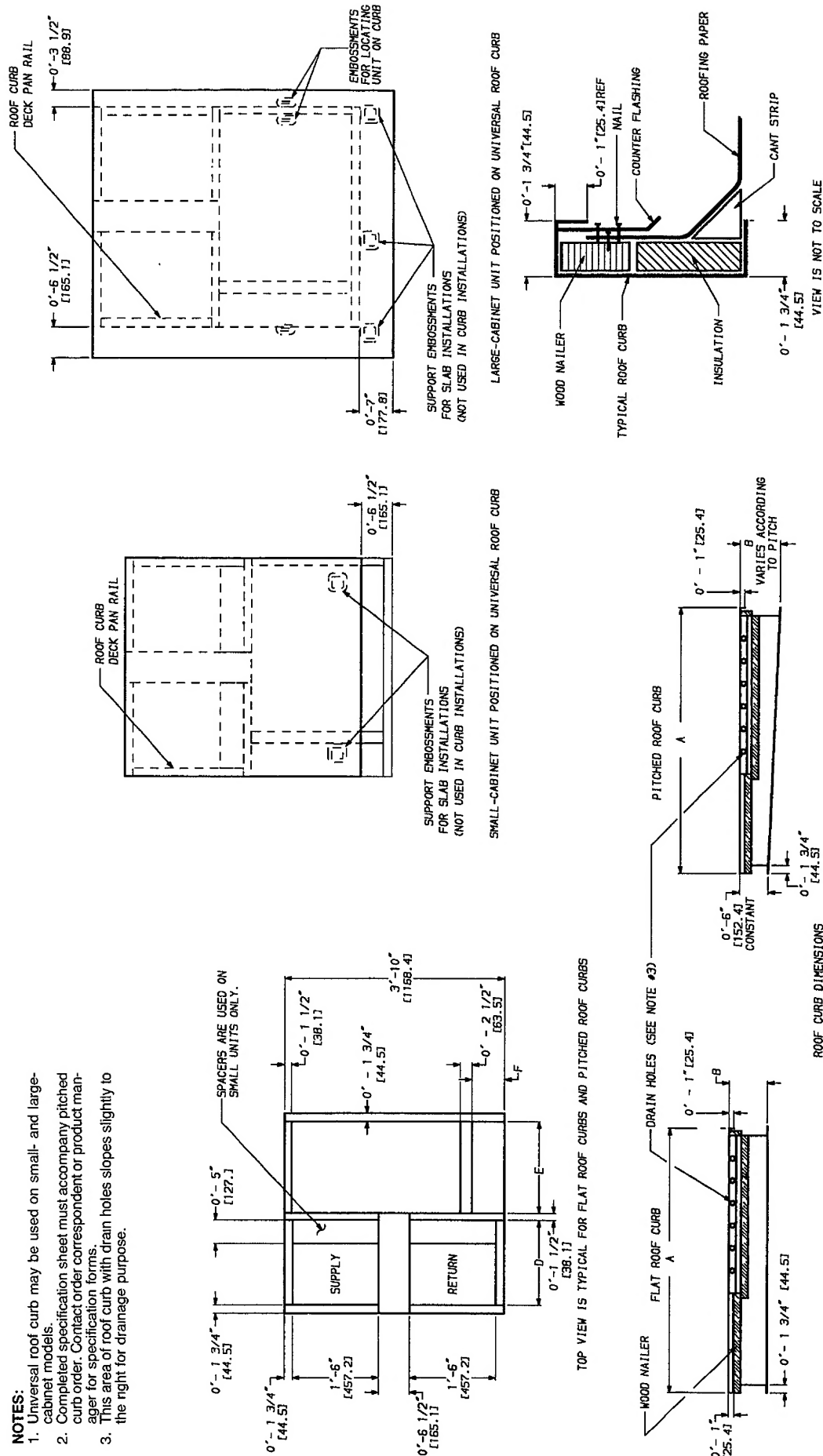


Fig. 5 — Dedicated Small-Cabinet Roof Curb Dimensions

UNIT SIZE	CURB	CURB P/N	A	B	C	D	E	F	ROOF PITCH
587A018040-587A060120	Flat	389059-701	4'-8"	0'-8"	—	1'-11 1/4"	2'-3 3/4"	0'-7"	—
		389059-702	0'-11"	0'-11"	—	590.5	704.8	[177.8]	
Pitched (See Note 2)		389059-703	1'-2"	1'-2"	—	—	—	—	1:12
		389060-701	4'-8"	0'-10 1/2"	—	1'-11 1/4"	2'-3 3/4"	0'-7"	2:12
		389060-702	0'-11"	1'-3 1/4"	—	590.5	704.8	[177.8]	3:12
		389060-703	1'-8"	1'-8"	—	—	—	—	4:12
		389060-704	2'-1/4"	2'-1/4"	—	—	—	—	5:12
		389060-705	2'-5 1/4"	2'-5 1/4"	—	—	—	—	6:12
		389060-706	2'-10"	2'-10"	—	—	—	—	

NOTES:

- Universal roof curb may be used on small- and large-cabinet models.
- Completed specification sheet must accompany pitched curb order. Contact order correspondent or product manager for specification forms.
- This area of roof curb with drain holes slopes slightly to the right for drainage purpose.



(text continued from page 2)

If a plenum return is used on a downflow unit, the return should be ducted through the roof deck to comply with applicable fire codes.

A minimum clearance is not required around ductwork. Cabinet return-air static shall not exceed -0.25 in. wg with economizer.

NOTE: Connection may be made to roof curb before unit is set in place.

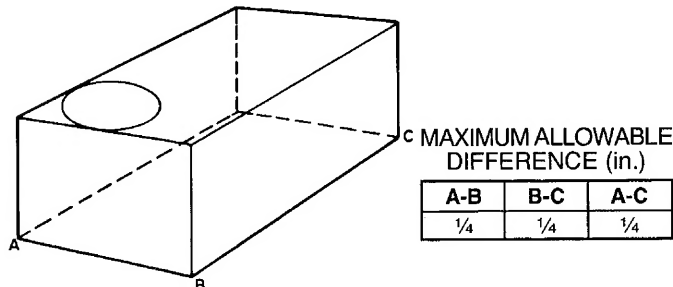


Fig. 7 — Unit Leveling Tolerances

III. RIG AND PLACE UNIT

Inspect unit for transportation damage. File any claim with transportation agency. Keep upright and do not drop. Spreader bars are not required if top crating is left on unit. Rollers may be used to move unit across a roof. Level by using unit frame as a reference. See Table 1 and Fig. 8 for additional information. Unit weight is shown in Fig. 3 and 4.

CAUTION: Use spreader bars and crate top when rigging the unit to be lifted. The 587A units must be rigged for lifting as shown in Fig. 8. Use extreme caution to prevent damage when moving the unit. Unit must remain in an upright position during all rigging and moving operations. The unit must be level for proper condensate drainage; therefore, the ground-level pad or accessory roof curb must be level before setting the unit in place. When a field-fabricated support is used, ensure that the support is level and properly supports the unit.

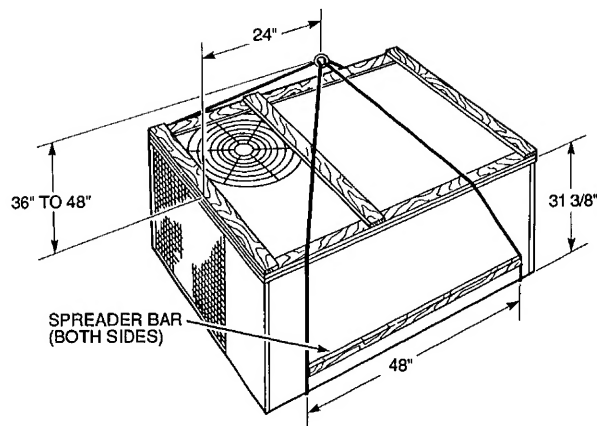


Fig. 8 — Suggested Rigging

IV. FIELD CONNECTIONS

A. Condensate Disposal

NOTE: Ensure that condensate-water disposal methods comply with local codes, restrictions and practices.

The 587A units dispose of condensate water through a 3/4-in. NPT drain fitting. See Fig. 3 and 4 for location.

Install a 2-in. trap at the drain fitting to ensure proper drainage. See Fig. 9. Make sure that the outlet of the trap is at least 1 in. lower than the unit drain pan connection to prevent the pan from overflowing. Prime the trap with water.

If the installation requires draining the condensate water away from the unit, connect a drain tube. Do not use pipe size smaller than unit drain connection (3/4-in. NPT). Pitch the drain tube downward at a slope of at least 1 inch in every 10 ft of horizontal run. Be sure to check the drain tube for leaks.

Condensate water can be drained directly onto the roof in roof-top installations (where permitted) or onto a gravel apron in ground-level installations. When using a gravel apron, make sure it slopes away from the unit.

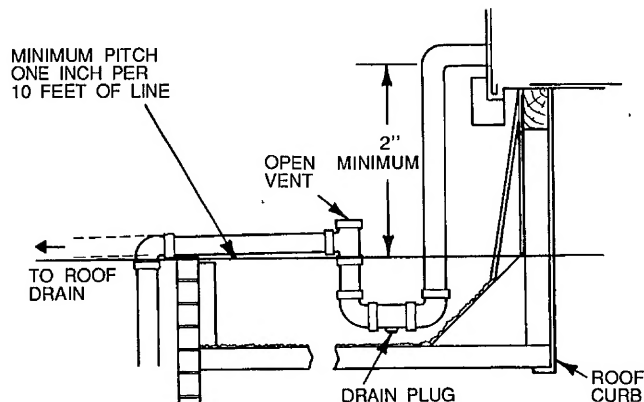


Fig. 9 — External Trap Condensate Drain

B. Install Venting

The vent-cap assembly is shipped in the burner compartment. Remove the access door to locate the assembly.

CAUTION: The venting system is designed to ensure proper venting. The vent-cap assembly must be installed as indicated in this section of the unit installation instructions.

NOTE: Screw holes in the flue assembly and the unit flue panel are not symmetrically located — ensure proper orientation when installing these components.

Refer to Fig. 10 and install the vent cap as follows:

1. Place vent-cap assembly over flue panel, orient screw holes in vent cap with holes in flue panel and secure vent cap in place by inserting the single screw on the right side of vent cap.
2. Place the vent-cap guard over the vent cap and orient holes in vent-cap guard with holes in vent cap and flue panel. Secure the entire assembly with the remaining 2 screws on the left side of vent cap and vent-cap guard assembly.

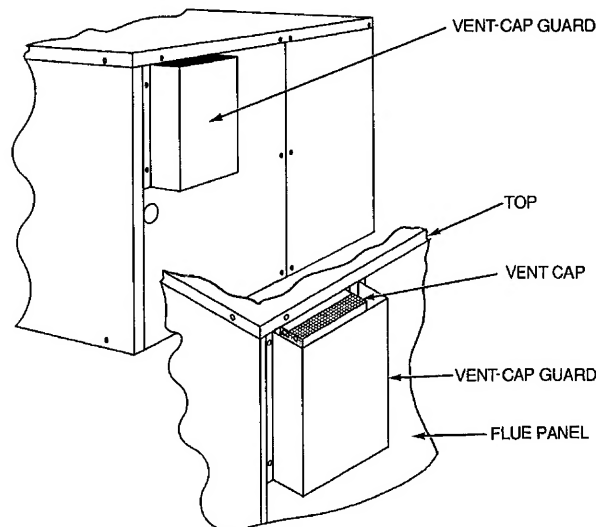


Fig. 10 — Vent-Cap Assembly

Table 1 — Specifications

UNIT SIZE 587A	018040	024040	024060	030040	030060	030080	036060	036080	036096
NOMINAL CAPACITY (ton)	1½	2	2	2½	2½	2½	3	3	3
OPERATING WEIGHT (lb)	455	454	460	470	476	480	486	490	490
COMPRESSORS Quantity	Hermetic Scroll 1								
REFRIGERANT (R-22) Charge (lb)	3.85	4.10	4.10	4.30	4.30	4.30	4 60	4 60	4 60
REFRIGERANT METERING DEVICE Piston Size	59	65	65	67	67	67	80	80	80
CONDENSER COIL Rows...Fins/in. Face Area (sq ft)	2...20 14 3	2...20 14 3	2...20 14 3	2...20 14.3	2...20 14.3	2...20 14.3	2...20 14 3	2...20 14 3	2...20 14.3
CONDENSER FAN Nominal Cfm Diameter (in.) Motor Hp (Rpm)	2000 20 ¼ (825)	2000 20 ¼ (825)	2000 20 ¼ (825)	2000 20 ¼ (825)	2000 20 ¼ (825)	2000 20 ¼ (825)	2500 20 ¼ (1100)	2500 20 ¼ (1100)	2500 20 ¼ (1100)
EVAPORATOR COIL Rows...Fins/in. Face Area (sq ft)	3...14 2.5	3...14 2 5	3...14 2.5	3...14 3 3	3...14 3.3	3...14 3.3	3...14 4 0	3...14 4.0	3...14 4.0
EVAPORATOR FAN Nominal Cfm Size (in.)	600 10 x 8	800 10 x 8	800 10 x 8	1000 10 x 8	1000 10 x 8	1000 10 x 8	1200 10 x 10	1200 10 x 10	1200 10 x 10
FURNACE SECTION Burner Orifice No. (Qty...drill size) Natural Gas Burner Orifice No. (Qty...drill size) Propane Gas Pilot Orifice Diameter, Dual Orifice (in.) Natural Gas Pilot Orifice Diameter (in.) Propane Gas	2. 44 2.. 55 0225/ 0240 010	2.. 44 2.. 55 0225/ 0240 .010	3. 44 3.. 55 0225/ 0240 010	2 44 2.. 55 0225/ 0240 010	3 .44 3 .55 0225/ 0240 .010	4. 44 4 .55 0225/ 0240 010	3 .44 3 .55 0225/ 0240 .010	4 .44 4 ..55 0225/ 0240 .010	4 ..42 4 54 0225/ 0240 .010
RETURN-AIR FILTERS (sq in.)* Disposable Cleanable	288 192	288 192	528 352	528 352	528 352	624 416	624 416	624 416	720 480

UNIT SIZE 587A	042060	042080	042096	048080	048100	048120	060080	060100	060120
NOMINAL CAPACITY (ton)	3½	3½	3½	4	4	4	5	5	5
OPERATING WEIGHT (lb)	496	500	500	489	495	501	498	504	510
COMPRESSORS Quantity	Hermetic Scroll 1								
REFRIGERANT (R-22) Charge (lb)	5.20	5.20	5.20	6.55	6.55	6 55	7 40	7.40	7.40
REFRIGERANT METERING DEVICE Piston Size	76	76	76	—	—	—	—	—	—
CONDENSER COIL Rows...Fins/in. Face Area (sq ft)	2...20 14 3	2...20 14.3	2...20 14.3	2...17 10.2	2...17 10.2	2...17 10 2	2...17 10.2	2...17 10 2	2...17 10 2
CONDENSER FAN Nominal Cfm Diameter (in.) Motor Hp (Rpm)	2500 20 ¼ (1100)	2500 20 ¼ (1100)	2500 20 ¼ (1100)	3400 22 ¼ (1100)	3400 22 ¼ (1100)	3400 22 ¼ (1100)	3400 22 ¼ (1100)	3400 22 ¼ (1100)	3400 22 ¼ (1100)
EVAPORATOR COIL Rows...Fins/in. Face Area (sq ft)	4...14 4 0	4...14 4 0	4...14 4.0	4...15 5.44	4...15 5.44	4. 15 5.44	4. 15 5 44	4. 15 5 44	4...15 5 44
EVAPORATOR FAN Nominal Cfm Size (in.)	1400 10 x 10	1400 10 x 10	1400 10 x 10	1600 10 x 10	1600 10 x 10	1600 10 x 10	2000 10 x 10	2000 10 x 10	2000 10 x 10
FURNACE SECTION Burner Orifice No. (Qty...drill size) Natural Gas Burner Orifice No. (Qty...drill size) Propane Gas Pilot Orifice Diameter, Dual Orifice (in.) Natural Gas Pilot Orifice Diameter (in.) Propane Gas	3 44 3...55 0225/ 0240 010	4...44 4. 55 0225/ 0240 .010	4 .42 4 .54 0225/ 0240 .010	4 ..44 4 .55 0225/ 0240 .010	5 .44 5 55 0225/ 0240 .010	6 .44 6 .55 0225/ 0240 .010	4 .44 4...55 0225/ 0240 .010	5 .44 5 .55 0225/ 0240 .010	6...44 6 55 0225/ 0240 010
RETURN-AIR FILTERS (sq in.)* Disposable Cleanable	720 480	720 480	720 480	816 544	816 544	816 544	960 640	960 640	960 640

LEGEND

ARI — Air-Conditioning & Refrigeration Institute

*Required filter areas shown are based on the larger ARI-rated cooling airflow or the heating airflow at a velocity of 300 ft/min for the disposable type or 450 ft/min for the high-capacity cleanable type

C. Gas Piping

The gas supply pipe enters the unit through the access hole provided. The gas connection to the unit is made to the ½-in. FPT gas inlet on the manual shutoff or gas valve.

Install a gas supply line that runs to the heating section. Refer to Table 2 and NFGC for gas pipe sizing. *Do not use cast iron pipe.* Check the local utility for recommendations concerning existing lines. Size gas supply piping for 0.5 in. wg maximum pressure drop. *Never use pipe smaller than the ½-in. FPT gas inlet on the unit gas valve.*

For natural gas applications, the gas pressure at unit gas connection must not be less than 5 in. wg or greater than 13 in. wg while the unit is operating. For LP (liquid propane) applications, the gas pressure must not be less than 11 in. wg or greater than 13 in. wg at the unit connection.

When installing the gas supply line, observe local codes pertaining to gas pipe installations. Refer to NFGC, ANSI Z223.1-1988 (in Canada, CAN/CGA B149.1, [2]-M86) or NFPA 54-1988 in the absence of local building codes. Adhere to the following pertinent recommendations:

1. Avoid low spots in long runs of pipe. Grade all pipe ¼ inch in every 15 ft to prevent traps. Grade all horizontal runs downward to risers. Use risers to connect to heating section and to meter.
2. Protect all segments of piping system against physical and thermal damage. Support all piping with appropriate straps, hangers, etc. Use a minimum of one hanger every 6 ft. For pipe sizes larger than ½ in., follow recommendations of national codes.
3. Apply joint compound (pipe dope) sparingly and only to male threads of joint when making pipe connections. Use only pipe dope that is resistant to action of liquefied petroleum gases as specified by local and/or national codes. *Never use Teflon tape.*
4. Install sediment trap in riser leading to heating section on natural and LP gas units, per Fig. 11. This drip leg functions as a trap for dirt and condensate.
5. Install an accessible, external, manual, main shutoff valve in gas supply pipe within 6 ft of heating section.

6. Install ground-joint union close to heating section between unit manual shutoff and external manual main shutoff valve.
7. Pressure-test all gas piping in accordance with local and national plumbing and gas codes before connecting piping to unit.

NOTE: If gas supply system will be pressure tested *after* the gas supply piping has been connected to the unit gas valve, the following procedures must be observed:

When pressure testing the gas supply piping system at test pressure exceeding 0.5 psig, supply piping must be disconnected from the gas valve.

When pressure testing the gas supply system at test pressure less than or equal to 0.5 psig, the unit heating section must be isolated from the gas piping system by closing the external, main, manual shutoff valve and slightly opening the ground-joint union.

⚠ CAUTION: Unstable operation may occur when the gas valve and manifold assembly are forced out of position while connecting improperly routed rigid gas piping to the gas valve. Use a backup wrench when making connection to avoid strain on, or distortion of, the gas control piping.

⚠ CAUTION: If a flexible conductor is required or allowed by the authority having jurisdiction, black iron pipe shall be installed at the gas valve and extend a minimum of 9 in. outside the unit casing.

⚠ WARNING: Never use a match or other open flame when checking for gas leaks. Never purge gas line into combustion chamber. Failure to adhere to this warning could result in an explosion causing personal injury or death.

8. Check for gas leaks at all field-installed and factory-installed gas lines after all piping connections have been completed. Use soap-and-water solution (or method specified by local codes and/or regulations).

Table 2 — Maximum Gas Flow Capacity of Pipe in Cubic Feet of Gas Per Hour for Gas Pressures of 0.5 Psig or Less and a Pressure Drop of 0.5 in. wg (Based on a 0.60 Specific Gravity Gas)

NOMINAL IRON PIPE SIZE (in.)	INTERNAL DIAMETER (in.)	LENGTH OF PIPE, FT*													
		10	20	30	40	50	60	70	80	90	100	125	150	175	200
½	.622	175	120	97	82	73	66	61	57	53	50	44	40	—	—
¾	.824	360	250	200	170	151	138	125	118	110	103	93	84	77	72
1	1.049	680	465	375	320	285	260	240	220	205	195	175	160	145	135
1¼	1.380	1400	950	770	600	580	530	490	460	430	400	360	325	300	280
1½	1.610	2100	1460	1180	990	900	810	750	690	650	620	550	500	460	430

Refer to Table C-4, NFPA 54-1984

*This length includes an ordinary number of fittings

NOTE: Typical natural gas heating value is 1000 Btuh per cu ft.

For example: A 96,000 Btuh input unit equals 96 cu ft per hour or $\frac{96,000}{1,000} = 96$ cu ft/hr.

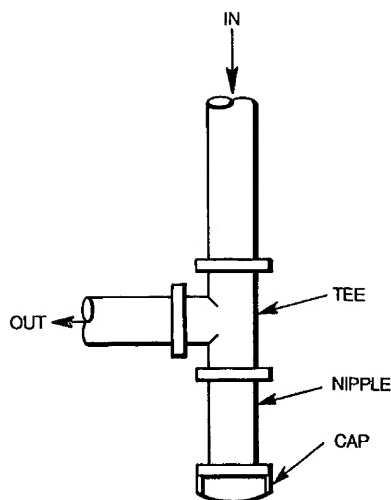


Fig. 11 – Sediment Trap

Liquid Propane

Units are shipped for use with natural gas, but may be field-converted for use with liquid propane using an accessory LP conversion kit.

All LP gas equipment must conform to NFPA safety standards.

The LP gas pressure at the unit must be 10.5 in. wg under full load. Maintaining proper gas pressure depends on:

- Vaporization rate (vaporization rate is determined by the temperature of the LP gas and the level of LP gas in the tank).
- Proper pressure regulation (2-stage regulation is more cost effective and more efficient).
- Pressure drop in lines between regulators and between the second-stage regulator and the appliance. Pipe size is determined by the length of the pipe run and the total load of all appliances.

Contact your LP gas supplier or regulator manufacturer for further details regarding tank sizing, recommended regulator settings and pipe sizing.

Special pipe compound must be used when assembling piping for LP gas, as white lead or commercial compounds will be dissolved easily. Use a shellac-based compound suitable for use with LP.

D. Field Duct Connections

NOTE: The design and installation of the duct system must be in accordance with the standards of NFPA for the installation of nonresidence-type air conditioning and ventilating systems, NFPA 90A or residence-type, NFPA 90B; and/or local codes and ordinances.

The 587A units have duct flanges on the supply- and return-air openings on the side (unit sizes 018-042 only) and bottom of the unit.

Adhere to the following criteria when selecting, sizing and installing the duct system:

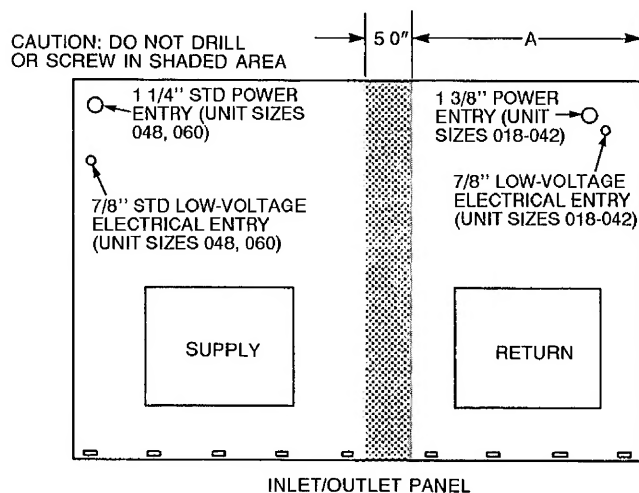
1. Unit sizes 018-042 are shipped in the downflow configuration. To convert to horizontal discharge, remove horizontal duct opening covers. Using the same screws, install covers with insulation side up (facing inside) on the unit on downflow duct openings. Seals around duct openings must be tight.

Unit sizes 048 and 060 are shipped with all 4 duct openings covered. Remove appropriate panels for intended installation.

2. Select and size ductwork, supply-air registers and return-air grilles according to ASHRAE (American Society of Heating, Refrigeration, and Air Conditioning Engineers) recommendations.

CAUTION: When drilling the duct system fastening holes into the side of the unit for duct flanges, use extreme care not to puncture the coil or coil tubes. See Fig. 12.

3. Use flexible transition between rigid ductwork and unit to prevent transmission of vibration. The transition may be screwed or bolted to duct flanges. Use suitable gaskets to ensure weathertight and airtight seal.
4. When horizontal return is used, install external, field-supplied air filter(s) in return-air ductwork where it is easily accessible for service. Recommended filter sizes are shown in Table 1.
5. Size all ductwork for maximum required airflow (either heating or cooling) for unit being installed. Avoid abrupt duct size increases or decreases.
6. Adequately insulate and weatherproof all ductwork located outdoors. Insulate ducts passing through unconditioned space, and use vapor barrier in accordance with latest issue of SMACNA (Sheet Metal and Air Conditioning Contractors National Association) and ACCA (Air-Conditioning Contractors of America) minimum installation standards for heating and air conditioning systems. Secure all ducts to building structure.
7. Flash, weatherproof and vibration-isolate all openings in building structure in accordance with local codes and good building practices.



NOTE: Alternate power and low-voltage entries for unit sizes 048 and 060 not shown.

UNIT 587A	"A" (in.)
018-042	20½
048, 060	25½

Fig. 12 – Location of Coil Area Not to be Drilled

E. Electrical Connections

⚠ WARNING: The unit cabinet must have an uninterrupted, unbroken, electrical ground to minimize the possibility of personal injury if an electrical fault should occur. This ground may consist of electrical wire connected to the unit ground lug in the control compartment, or conduit approved for electrical ground when installed in accordance with NEC (National Electrical Code), ANSI/NFPA 70-1990 (in Canada, Canadian Electrical Code CSA C22.1) and local electrical codes. *Do not use gas piping as an electrical ground.* Failure to adhere to this warning could result in personal injury.

⚠ CAUTION: Failure to follow these precautions could result in damage to the unit being installed.

Field Power Supply

1. Make all electrical connections in accordance with NEC ANSI/NFPA and local electrical codes governing such wiring. In Canada, all electrical connections must be in accordance with CSA (Canadian Standards Association) Standard C22.1 Canadian Electrical Code Part 1 and applicable local codes. Refer to unit wiring diagram.
2. Use only *copper or copper-clad* conductor for connections between field-supplied electrical disconnect switch and unit. **DO NOT USE ALUMINUM WIRE.** Maximum wire size is no. 6 AWG (American Wire Gage).
3. Voltage to compressor terminals during operation must be within voltage range indicated on unit nameplate (also see Table 3).
4. Insulate low-voltage wires for highest voltage contained within conduit when low-voltage control wires are run in same conduit as high-voltage wires.

5. Do not damage internal components when drilling through any panel to mount electrical hardware, conduit, etc.

High-Voltage Connections

The unit must have a separate electrical service with a field-supplied, waterproof, fused disconnect switch mounted at, or within sight from, the unit. Refer to the unit rating plate for maximum fuse/circuit breaker size and minimum circuit amps (ampacity) for wire sizing. Table 3 shows recommended wire sizes based on rating plate data.

The field-supplied disconnect switchbox may be mounted on the unit over the high-voltage inlet hole when the standard power and low-voltage entry points are used. Disconnect may be mounted on the duct panel of unit. See Fig. 12 for acceptable locations. Also see Fig. 3 and 4.

Proceed as follows to complete the high-voltage connections to the unit:

Unit Sizes 018-042:

1. Connect ground lead to chassis ground connection when using separate ground wire.
2. Run high-voltage leads into unit control box and connect to contactor. See unit wiring label, and Fig. 13.

Unit Sizes 048,060 Standard Power Entry Location (Knockouts Located on Unit Duct Panel):

1. Remove blower access panel and knockouts from low- and high-voltage entry points.
2. Connect ground lead to chassis ground connection when using separate ground wire.
3. Run high-voltage leads into junction box through 1¼ diameter knockout hole in duct panel using an acceptable means of maintaining water integrity.
4. Connect wires to power leads. See unit wiring label or Fig. 13.

Table 3 — Electrical Data

UNIT 587A	V-PH-HZ	VOLTAGE RANGE		COMPRESSOR (each)		EVAPORATOR- FAN MOTOR		CONDENSER- FAN MOTOR	UNIT FLA	POWER SUPPLY		AWG MINIMUM WIRE SIZE	MAXIMUM WIRE LENGTH (ft)
		Min	Max	RLA	LRA	Hp	FLA	FLA		MCA	MOCPS*		
018040	208/230-1-60	187	253	10.7	50.0	¼	3.5	0.8	15.0	17.7	25	12	80
024040	208/230-1-60	187	253	12.9	62.5	⅓	2.5	0.8	16.2	19.4	25	12	70
024060						⅓	2.5	0.8	16.2	19.4	25	12	70
030040	208/230-1-60	187	253	15.0	76.0	⅓	2.5	0.8	18.3	21.1	30	10	100
030060						⅓	2.5	0.8	18.3	21.1	30	10	100
030080						½	3.0	0.8	18.8	22.6	30	10	100
036060	208/230-1-60	187	253	20.0	90.5	½	3.0	1.5	24.5	29.5	40	10	75
036080						½	3.0	1.5	24.5	29.5	40	10	75
036096						¾	4.5	1.5	25.0	31.0	40	8	100
042060	208/230-1-60	187	253	22.0	107.0	½	3.0	1.5	26.5	32.0	50	8	100
042080						½	3.0	1.5	26.5	32.0	50	8	100
042096						¾	4.5	1.5	27.0	33.5	50	8	100
048080	208/230-1-60	187	253	26.4	129.0	¾	4.2	2.1	32.7	39.3	60	8	90
048100						¾	4.2	2.1	32.7	39.3	60	8	90
048120						¾	4.2	2.1	32.7	39.3	60	8	90
060080	208/230-1-60	187	253	32.1	169.0	1.0	5.7	2.1	39.9	47.9	70	6	100
060100						1.0	5.7	2.1	39.9	47.9	70	6	100
060120						1.0	5.7	2.1	39.9	47.9	70	6	100

LEGEND

AWG	— American Wire Gage	LRA	— Locked Rotor Amps
FLA	— Full Load Amps	MCA	— Minimum Circuit Amps
HACR	— Heating, Air Conditioning and Refrigeration	MOCPS	— Maximum Overcurrent Protection
Hp	— Nominal Horsepower	RLA	— Rated Load Amps

*Fuse or HACR breaker.

NOTES:

1. In compliance with NEC requirements for multimotor and combination load equipment (refer to NEC Articles 430 and 440), the overcurrent protective device for the unit shall be fuse or HACR breaker. The CGA units may be fuse or circuit breaker.
2. Minimum wire size is based on 60° C copper wire. If other than 60° C wire is used, or if length exceeds wire length in table, determine size from NEC.
3. Voltage drop of wire must be less than 2% of rated voltage.



*Unit Sizes 048,060 Alternate Power Entry Location
(Knockouts Located Near Control Box):*

1. Connect ground lead to chassis ground connection when using separate ground wire.
2. Remove leads from terminals 11 and 23. These are the leads that go to the standard power entry. Pull these wires out of the main control box and secure to compressor wires using field-supplied wire tie. Ensure that these leads are secured in such a way as to avoid contact with live terminals or moving parts.
3. Run high-voltage leads into control box and connect to contactor. See unit wiring label and Fig. 13.

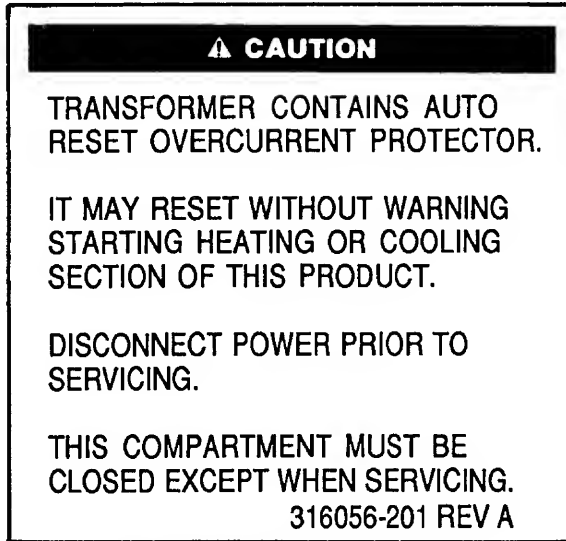
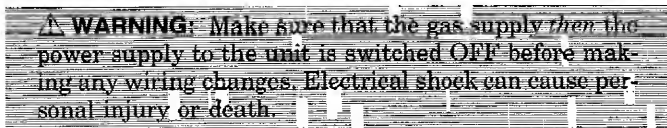


Fig. 13 — Transformer Label

Special Procedures for 208-V Operation



For operation on 208 v:

1. Disconnect the orange transformer-primary lead from the contactor. See the unit wiring label.
2. Remove the tape and cover from the terminal on the end of the red transformer-primary lead. Save the cover.
3. Connect the red lead to the contactor terminal from which the orange lead was disconnected.
4. Insulate the loose terminal on the orange lead. Wrap the cover with electrical tape so that the metal terminal cannot be seen.

Indoor blower-motor speed taps should be changed for 208-v operation on 208/230-v rated units. To change blower speed, interchange motor leads. High speed is for cooling and medium speed is for heating operation. See Indoor Airflow and Airflow Adjustments section on page 19 and unit wiring label.

Control Voltage Connections

Install a factory-approved thermostat. See Table 4.

Locate the room thermostat on an inside wall in the space to be conditioned, where it will not be subjected to either a cooling or heating source or direct exposure to sunlight. Mount the thermostat 4 to 5 ft above the floor.

Use no. 18 AWG color-coded, insulated (35 C minimum) wires to make the control voltage connections between the thermostat and the unit. If the thermostat is located more than

100 ft from the unit (as measured along the control voltage wires), use no. 16 AWG color-coded, insulated (35 C minimum) wires.

A grommeted, control-voltage inlet hole is located in the panel adjacent to the control access panel. See Fig. 3 and 4. To make connections:

Unit Sizes 018-042:

1. Run the low-voltage leads from the thermostat, through the inlet hole and to the control voltage terminals through a hole in the bottom of the unit control box.
2. Pass control voltage leads through wire ties located under unit control box.
3. Connect the thermostat leads to the terminals as shown in Fig. 14.

*Unit Sizes 048,060 Standard Control Entry Location
(Knockouts Located on Unit Duct Panel):*

1. With knockouts removed, relocate rubber grommet from alternate low-voltage entry to 3/8-in. diameter knockout hole on duct panel.
2. Route field low-voltage wire through hole in grommet leaving excess wire external to unit to form drip loop.
3. Connect leads using field-supplied wire nuts as shown in Fig. 14.
4. Replace blower access panel.

*Unit Sizes 048,060 Alternate Control Entry Location
(Knockouts Located Near Control Box):*

1. Locate the low-voltage leads that pass through the low-voltage control box and exit out of the bottom of the control box to the low-voltage junction box. Cut leads approximately 6 in. below control box. Pull leads back through hole in bottom of control box. Secure leads going to junction box using field-supplied wire tie.
2. Route field low-voltage wiring through grommeted hole in panel and into low-voltage junction box through hole in bottom of control box.
3. Make junctions using field-supplied wirenuts as shown on wiring label or Fig. 14.

Table 4 — Recommended Thermostats

TYPE	PART NO.
Single-Stage Heating and Cooling Manual Changeover	HH01PC184
Auto. Changeover	HH01PC185

Heat Anticipator Setting

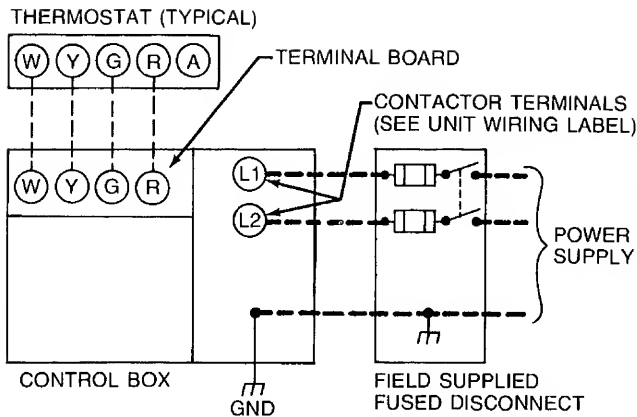
The room thermostat heat anticipator must be adjusted properly to ensure proper heating performance. Set the heat anticipator, using an ammeter to determine the exact required setting.

NOTE: For thermostat selection purposes, use 1.2 amp for the approximate required setting.

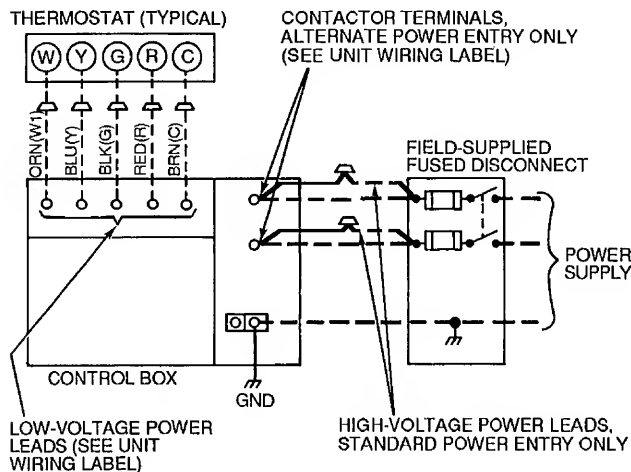
Failure to make a proper heat anticipator adjustment will result in improper operation, discomfort to the occupants of the conditioned space and inefficient energy utilization; however, the required setting may be changed slightly to provide a greater degree of comfort for a particular installation.

Transformer Circuit Breaker

The unit transformer contains an automatic reset overcurrent protector for control circuit protection. If this device trips, it may reset without warning, starting the heating or cooling section of this product. Use caution when servicing: if overcurrent protector continues to trip, there is a problem in the low-voltage electrical circuit, such as an electrical short, ground or transformer overload. Disconnect power, correct the condition and check for normal unit operation.



UNIT SIZES 018-042



UNIT SIZES 048,060

----- Field Control-Voltage Wiring
 ----- Field High-Voltage Wiring

Fig. 14 — High- and Control-Voltage Connections

F. Accessory Installation

At this time, any required accessories should be installed on the unit. Refer to Table 5 for available accessories. Control wiring information is provided in the unit wiring book.

PRE-START-UP

Proceed as follows to inspect and prepare the unit for initial startup:

1. Remove all access panels.
2. Read and follow instructions on all WARNING, CAUTION and INFORMATION labels attached to, or shipped with, unit.
3. Make the following inspections:
 - a. Inspect for shipping and handling damages such as broken lines, loose parts, disconnected wires, etc.
 - b. Inspect for oil at all refrigerant tubing connections and on unit base. Detecting oil generally indicates a refrigerant leak. Leak-test all refrigerant tubing connections using electronic leak detector, halide torch or liquid-soap solution. If refrigerant leak is de-

tected, see Repairing Refrigerant Leaks section on page 25.

- c. Inspect all field- and factory-wiring connections. Be sure that connections are completed and tight.

WARNING: Failure to observe the following warnings could result in serious personal injury:

1. Follow recognized safety practices and wear protective goggles when checking or servicing refrigerant system.
2. Do not operate compressor or provide any electric power to unit unless compressor terminal cover is in place and secured.
3. Do not remove compressor terminal cover until all electrical sources are disconnected.
4. Relieve and reclaim all refrigerant from system using both high- and low-pressure service ports before touching or disturbing anything inside terminal box if refrigerant leak is suspected around compressor terminals.
5. Never attempt to repair soldered connection while refrigerant system is under pressure.
6. Do not use torch to remove any component. System contains oil and refrigerant under pressure. To remove a component, wear protective goggles and proceed as follows:
 - a. Shut off gas supply and then electrical power to unit.
 - b. Relieve and reclaim all refrigerant from system.
 - c. Cut component-connecting tubing with tubing cutter and remove component from unit.
 - d. Carefully unsweat remaining tubing stubs when necessary. Oil can ignite when exposed to torch flame.

- d. Inspect coil fins. If damaged during shipping and handling, carefully straighten fins with a fin comb.

4. Verify the following conditions:

DANGER: Do not purge gas supply into the combustion chamber. Do not use a match or other open flame to check for gas leaks. Failure to adhere to this warning could result in an explosion causing personal injury or death.

- a. Make sure that gas supply has been purged, and that all gas piping has been checked for leaks.
- b. Make sure that condenser-fan blade is positioned correctly in fan orifice. *Blades should clear fan motor by no more than 1/4 inch.*
- c. Make sure that air filter(s) is in place.
- d. Make sure that condensate drain trap is filled with water to ensure proper drainage.
- e. Make sure that all tools and miscellaneous loose parts have been removed.
5. Compressors are internally spring mounted. Do not loosen or remove compressor holddown bolts.
6. Each unit system has 2 Schrader-type ports, one on the suction line and one on the compressor discharge line. Be sure that caps on the ports are tight.

Unit is now ready for initial start-up.

Table 5 — Accessory List

ACCESSORY		PART NUMBER						
		Small-Cabinet Units 587A					Large-Cabinet Units 587A	
		018040	024040 024060	030040 030060 030080	036060 036080 036096	042060 042080 042096	048080 048100 048120	060080 060100 060120
Dedicated Small-Cabinet Flat Roof Curb	8 in.			389049-701				—
	11 in.			389049-702				—
	14 in.			389049-703				—
Universal Flat Roof Curb	8 in.				389059-701			
	11 in.				389059-702			
	14 in.				389059-703			
Universal Pitched Roof Curb	1:12				389060-701			
	2:12				389060-702			
	3:12				389060-703			
	4:12				389060-704			
	5:12				389060-705			
	6:12				389060-706			
Dedicated Small-Cabinet Pitched Roof Curb	1:12			389050-701				—
	2:12			389050-702				—
	3:12			389050-703				—
	4:12			389050-704				—
	5:12			389050-705				—
	6:12			389050-706				—
Square-to-Round Transition (Curbs), Downflow	14 in.	312149-201		—				—
	16 in.	—		312149-202			312149-203	
	18 in.			—				312149-204
Square-to-Round Transition, Horizontal	14 in.			389048-701				—
	16 in.			389048-702			389043-703	
	18 in.			—			389048-704	
Square-to-Round Transition (16 in.) Truss, Downflow					312149-205			
Modulating Economizer, Downflow				312116-201			312116-202	
Two-Position Economizer, Downflow				315236-201			315236-202	
Modulating Economizer With Filter Rack, Downflow				312116-203			312116-204	
Two-Position Economizer With Filter Rack, Downflow				315236-203			315236-204	
Modulating Economizer, Horizontal				312121-201			312121-202	
Two-Position Economizer, Horizontal				315233-201			315233-202	
Manual Outdoor-Air Damper, Downflow					312118-201			
Barometric Relief Damper, Horizontal				312124-201			312124-202	
Filter Rack, Downflow				312120-201			312120-202	
Filter Rack, Horizontal				312123-201			312123-202	
Flexible Duct Kit	14 in.	312119-201		—				—
	16 in.			312119-202			312119-203	—
	18 in.			—			312119-204	
Flexible Duct Kit (14 in.) for 16-in. Truss Centers					312119-205			
Concentric Diffuser Box	14 in.	309410-204		—			—	
	16 in.			309410-201			309410-202	—
	18 in.			—			309410-203	
Low-Pressure Switch Kit					301619-702			
High-Pressure Switch Kit					301619-701			
0° F Low-Ambient Kit (Weatherprobe™ II Device)					389034-201			

START-UP

I. HEATING SECTION START-UP AND ADJUSTMENTS

⚠ CAUTION: Complete the required procedures given in Pre-Start-Up section, page 13, before starting unit.

Do not jumper any safety devices when operating the unit.

Ensure that burner orifices are aligned properly. Unstable operation may occur when the burner orifices in the manifold are misaligned.

Follow the lighting instructions on the heating section operation label (located inside the burner access door) to start the heating section.

However, when lighting the unit for the first time, perform the following additional steps: If the gas supply pipe was not purged before connecting the unit, it will be full of air. It is recommended that the ground joint union be loosened and the supply line be allowed to purge until the odor of gas is detected. Never purge gas lines into a combustion chamber. Immediately upon detection of gas odor, retighten the union. Allow 5 minutes to elapse, then light unit in accordance with Checking Heating Control Operation section below.

A. Checking Heating Control Operation

Start and check the unit for proper heating control operation as follows: (See furnace lighting instructions located inside burner access panel.)

1. Place the room thermostat SYSTEM switch in the HEAT position and the FAN switch in the AUTO. position.
2. Set the heating temperature control of the thermostat above room temperature.
3. Observe that after built-in time delays, the pilot automatically lights, the burners light and the blower motor starts. Observe that the burners and pilot go out, and that after a built-in delay the blower motor stops when the heating control setting of the thermostat is satisfied.

B. Gas Input

Check gas input and manifold pressure after unit start-up. (See Table 6.) If adjustment is required, proceed as follows:

⚠ CAUTION: These units are designed to consume the rated gas inputs using the fixed orifices at specified manifold pressures as shown in Table 6. **DO NOT RE-DRILL THE ORIFICES UNDER ANY CIRCUMSTANCES.**

The rated gas inputs shown in Table 6 are for altitudes from sea level up to 2000 ft above sea level. These inputs are based on natural gas with a heating value of 1050 Btu/ft³ at 0.65 specific gravity, or LP gas with a heating value of

2500 Btu/ft³ at 1.5 specific gravity. For elevations above 2000 ft, reduce input 4% for each 1000 ft above sea level. When the gas supply being used has a different heating value or specific gravity, refer to national and local codes, or contact your distributor to determine the required orifice size.

C. Adjusting Gas Input

The gas input to the unit is determined by measuring the gas flow at the meter or by measuring the manifold pressure. Measuring the gas flow at the meter is recommended for natural gas units. The manifold pressure must be measured to determine the input of LP gas units.

1. Measuring Gas Flow at Meter Method — Natural Gas Units

Minor adjustment can be made by changing the manifold pressure. The manifold pressure must be maintained between 3.2 and 3.8 in. wg. If larger adjustments are required, change main burner orifices following the recommendations of national and local codes.

NOTE: All other appliances that use the same meter must be turned off when gas flow is measured at the meter.

Proceed as follows:

- a. Turn off gas supply to unit.
- b. Remove pipe plug on outlet of gas valve, then connect manometer at this point. Turn on gas to unit.
- c. Record number of seconds for gas meter test dial to make one revolution.
- d. Divide number of seconds in Step c into 3600 (number of seconds in one hour).
- e. Multiply result of Step d by the number of cubic feet shown for one revolution of test dial to obtain cubic feet of gas flow per hour.
- f. Multiply result of Step e by Btu heating value of gas to obtain total measured input in Btuh. (Consult the local gas supplier if the heating value of gas is not known.)

Example: Assume that the size of test dial is one cubic foot, one revolution takes 30 seconds and the heating value of the gas is 1050 Btu/ft³. Proceed as follows:

- a. 30 seconds to complete one revolution.
- b. $3600 \div 30 = 120$.
- c. $120 \times 1 = 120 \text{ ft}^3$ of gas flow/hr.
- d. $120 \times 1050 = 126,000 \text{ Btuh input}$.

If the desired gas input is 120,000 Btuh, only a minor change in the manifold pressure is required.

Observe manifold pressure and proceed as follows to adjust gas input:

- a. Remove cover screw over regulator adjustment screw on gas valve.
- b. Turn regulator adjustment screw clockwise to increase gas input, or turn regulator adjustment screw counterclockwise to decrease input. Manifold pressure must be between 3.2 and 3.8 in. wg.

WARNING: Unsafe operation of the unit may result if manifold pressure is outside this range. Personal injury or unit damage may result.

- c. Replace cover screw cap on gas valve.
- d. Turn off gas supply to unit. Remove manometer from pressure tap. Replace pipe plug on gas valve. Turn on gas to unit. Check for leaks.

2. Measuring Manifold Pressure – LP Gas Units

The main burner orifices on an LP gas unit are sized for the unit rated input when the manifold pressure is 10.5 in. wg.

Proceed as follows to adjust gas input on an LP gas unit:

- a. Turn off gas to unit.
- b. Remove pipe plug on outlet of gas valve, then connect manometer at this point.
- c. Turn on gas to unit.
- d. Remove cover screw over regulator adjustment screw on gas valve.
- e. Adjust regulator adjustment screw for a manifold pressure reading of 10.5 in. wg. Turn adjusting screw clockwise to increase manifold pressure, or turn adjusting screw counterclockwise to decrease manifold pressure.
- f. Replace cover screw.
- g. Turn off gas to unit. Remove manometer from pressure tap. Replace pipe plug on gas valve, then turn on gas to unit. Check for leaks.

D. Check Burner Flame

Observe the unit heating operation, and watch the burner flames through the observation port to see if they are light blue and soft in appearance, and that the flames are approximately the same in appearance for each burner. See Fig. 15.

E. Blower Heat-Relay Operation (Unit Sizes 018-042 Only)

Blower relay PC1 (see the unit wiring diagram) is located in the control box and adjusts to permit either longer or shorter "off" cycles. The "on" cycle is factory set for one minute on timing. The adjusting dial on the relay (see Fig. 16) is factory set at the minimum position to provide optimum performance for most installations. On unusual installations, the length of time the blower remains on may require increasing. To increase blower operation time, rotate the adjusting dial counterclockwise. To decrease blower operation time, rotate dial clockwise.

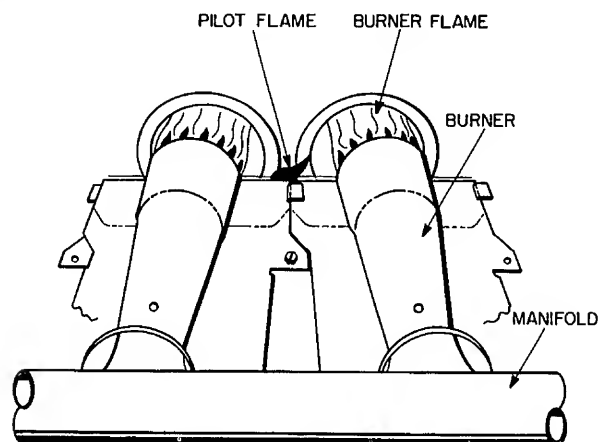


Fig. 15 – Monoport Burners

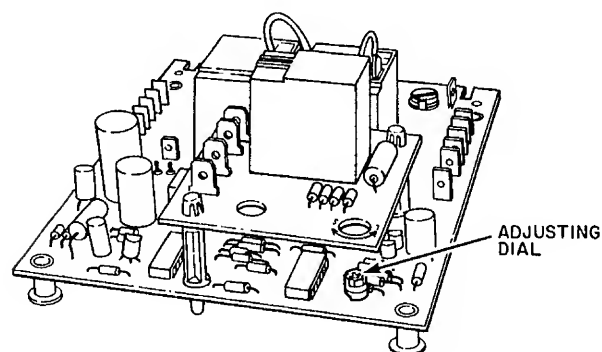


Fig. 16 – Blower Heat-Relay (Unit Sizes 018-042 Only)

Table 6 – Rated Gas Inputs at Indicated Manifold Pressures

MODEL NUMBER 587A	NUMBER OF ORIFICES	GAS SUPPLY PRESSURE (in. wg)				MANIFOLD PRESSURE (in. wg)		NATURAL GAS		PROPANE*	
		Natural		Propane		Natural	Propane	Orifice Drill Size	Heating Input (Btuh)†	Orifice Drill Size	Heating Input (Btuh)†
		Min	Max	Min	Max						
018040, 024040, 030040	2	5.0	13.6	11.0	13.6	3.5	10.5	44	40,000	55	40,000
024060, 030060, 036060, 042060	3	5.0	13.6	11.0	13.6	3.5	10.5	44	60,000	55	60,000
030080, 036080, 042080 048080, 060080	4	5.0	13.6	11.0	13.6	3.5	10.5	44	80,000	55	80,000
036096, 042096	4	5.0	13.6	11.0	13.6	3.5	10.5	42	96,000	54	96,000
048100, 060100	5	5.0	13.6	11.0	13.6	3.5	10.5	44	100,000	55	100,000
048120, 060120	6	5.0	13.6	11.0	13.6	3.5	10.5	44	120,000	55	120,000

*When a 587A unit is converted to propane, the unit must be modified. See kit instructions.

†Based on altitudes from sea level up to 2000 ft above sea level. For altitudes above 2000 ft, reduce input rating 4% for each 1000 ft above sea level. In Canada, from 2000 ft above sea level to 4,500 ft above sea level, derate the unit 10%.

F. Airflow and Temperature Rise

The heating section of each unit size is designed and approved for heating operation within the temperature rise range stamped on the unit rating plate.

Table 7 shows the approved temperature rise range for each unit, and the air delivery cfm at various temperature rises. The heating operation airflow must produce a temperature rise that falls within the approved range.

Refer to Indoor Airflow and Airflow Adjustments section on page 19, to adjust heating airflow when required.

G. Safety Check of Limit Control

The control shuts off the gas supply and energizes the circulating-air blower motor if the furnace overheats. The recommended method of checking this limit control is to gradually block off the return air after the unit has been operating for a period of at least 5 minutes. As soon as the limit control functions, the return-air opening should be unblocked to permit normal air circulation. By using this method to check the limit control, it can be established that the limit is functioning properly and the unit will "fail-safe" if there is a restricted circulating-air supply or motor failure. If the limit control does not function during this test, the cause must be determined and corrected.

H. Heating Sequence of Operation

Unit Sizes 018-042:

Room thermostat calls for heat, closing circuit between R and W 24-v control circuit terminals. (Power to the R terminal is supplied through LS and ALS safety switches.) The PC2 inducer control board is energized, which starts the inducer motor (IM). The IM comes up to speed and the vacuum in the collector box increases, opening the normally closed and closing the normally open contacts of the pressure switch (PS), energizing the circuit to the IGN (ignition control) and the pilot valve (PV). If the flame sensor proves the presence of the pilot flame, the internal switching of the ignition control deenergizes the spark generator and energizes the main gas valve (MV) and the IFR2 electronic timer. Gas flows to the main burners and is ignited by the pilot flame. The PC1 (electronic timer) will close the IFR2 relay 60 seconds after the burners are ignited and the blower motor IFM will start. When the thermostat is satisfied, the R and W circuit is opened and power is removed from the PC2 inducer control and the IGN, which causes the MV to close instantly and the IM is deenergized. The electronic timer PC1 will keep the IFM running an additional 60 to 90 seconds. Then the blower stops, and the unit is on standby until another call for heat.

NOTE: If the main limit switch opens due to the unit overheating, the blower motor is turned on through the electronic board.

If the pilot fails to light within a 120-second trial for ignition period from the initial call for heat, the IGN will go into a Retry mode after a period of approximately 5 minutes (following the 120-second trial for ignition period). If the pilot again fails to light, IGN will go into Retry mode; this cycle will be repeated until the pilot light ignites. If the pilot flame has been established but then extinguishes, the IGN will immediately reset as if it were the initial call for heat. If this occurs more than 3 times, the IGN will lock out the system, and the diagnostic LED (located on the IGN) will flash. To reset, open the R-W thermostat circuit for 30 seconds and reclose. If the diagnostic LED glows constantly, replace control.

Unit Sizes 048,060:

With power supplied to the unit, 24 v is supplied to the heating relay (HR) through the rollout switch (RS). This ener-

gizes the normally open set of contacts of heater relay. On a call for heat, 24 v is supplied to the induced draft relay (IDR) and to the time delay relay (TDR) through the "W" terminal of the thermostat. The 24 v energizes the TDR and after a delay of approximately 30 to 60 seconds, the normally open set of contacts close, energizing the indoor fan motor. The 24 v also energizes IDR, closing the normally open set of contacts starting the induced draft motor. As the induced draft motor comes to speed, it creates a negative pressure in the collector box of the burner compartment. The pressure switch senses this negative pressure, which closes the normally open set of contacts when a negative pressure of approximately .29 in. wg is reached. This switch closure allows the 24 v to pass through the safety chain, auxiliary limit switch (ALS), limit switch (LS), and pressure switch (PS), energizing the "TH" terminal of the ignition control (ICP). If a rollout occurs, the rollout switch will open and deenergize the heater relay. The normally open set of contacts will break the safety chain to the ignition control. With the "TH" terminal energized, the pilot valve of the main gas valve is energized immediately and gas is allowed to flow to the pilot; simultaneously, the ignition circuit of the ICP is energized, creating a spark and igniting the pilot. If the pilot fails to ignite after a period of 2 minutes, both the pilot valve and spark will cease for a period of 5 minutes. When the 5 minutes have elapsed, the pilot valve and spark will energize for another try for ignition. If the pilot fails to light again, the ICP will continue going into a retry mode until the pilot ignites or power is removed from the "TH" terminal. If the pilot does ignite, the flame is sensed through the flame rectification circuit through "FP" terminal of the ICP. (A minimum of .1 ma dc is needed for the sensing circuit, but a normal current of .5 to .7 ma dc should be attained for continued reliable operation.) The main valve opens and allows gas to flow to the main burners, where it is ignited by the pilot. When the call for heat has been satisfied, the ICP, TDR, and IDR are deenergized, immediately deenergizing the gas valve and induced draft motor. The indoor motor continues to run for approximately 45 to 90 seconds.

I. Limit Switches

Normally-closed limit switch LS completes the control circuit through the thermostat R circuit. Should the leaving-air temperature rise above the maximum allowable temperature, the limit switch opens and the R control circuit "breaks." Any interruption in the "R" control circuit instantly closes the gas valve and stops gas flow to the burners and pilot. The blower motor continues to run until LS resets.

When the air temperature at the limit switch drops to the low-temperature setting of the limit switch, the switch closes and completes the R control circuit. The electric-spark ignition system cycles and the unit returns to normal heating operation.

J. Auxiliary Limit Switch – Blower

Blower auxiliary limit switch (ALS1) is a temperature-actuated automatic reset switch and is connected in series with the LS. The function of the switch is to prevent abnormal blower-compartment temperatures. The switch is mounted on the blower housing. When the temperature at the auxiliary switch reaches the maximum allowable temperature, the R control circuit "breaks", closing the gas valve and stopping gas flow to the burners and pilot. The switch will reset automatically when the blower-compartment temperature returns to normal. The IFM continues to run until ALS1 resets.

K. Auxiliary Limit Switch – Rollout

The function of the switch is to close the main gas valve

in the event of flame rollout. The switch is located above the main burners. When the temperature at the auxiliary switch reaches the maximum allowable temperature, the R control circuit trips, closing the gas valve and stopping gas flow to the burners and pilot. If the switch cycles again, investigate the problem. The IFM continues to run until switch resets.

II. COOLING SECTION START-UP AND ADJUSTMENTS

⚠ CAUTION: Complete the required procedures given in Pre-Start-Up section, page 13, before starting the unit.

Do not jumper any safety devices when operating the unit.

Do not operate the compressor when the outdoor temperature is below 55 F (unless accessory low-temperature kit is installed).

Do not rapid-cycle the compressor. A 5-minute time delay is provided to prevent compressor damage.

A. Checking Cooling Control Operation

Start and check the unit for proper cooling control operation as follows:

1. Place room thermostat SYSTEM switch in OFF position. Observe that blower motor starts when FAN switch is placed in ON position and shuts down when FAN switch is placed in AUTO. position.
2. Place SYSTEM switch in COOL position and FAN switch in AUTO. position. Set cooling control below room temperature. Observe that compressor, condenser fan and evaporator blower motors start. Observe that cooling cycle shuts down when control setting is satisfied. Blower motor has off-delay of approximately 45 seconds for unit sizes 018-042 and 30 seconds for unit sizes 048 and 060 on shutdown.
3. When using an autochangeover room thermostat, place both SYSTEM and FAN switches in AUTO. positions. Observe that unit operates in heating mode when temperature control is set to "call for heating" (above room temperature) and operates in cooling mode when temperature control is set to "call for cooling" (below room temperature).

B. Checking and Adjusting Refrigerant Charge

The refrigerant system is fully charged with R-22 refrigerant, tested and factory-sealed.

NOTE: Adjustment of the refrigerant charge is not required unless the unit is suspected of not having the proper R-22 charge. For all applications, the correct R-22 charge for the best performance is the charge that results in a suction gas superheat of 10 F at the compressor inlet when the unit is operating at the ARI (Air-Conditioning & Refrigeration Institute) rating conditions of 95 F db outdoor ambient temperature and 80 F db/67 F wb indoor ambient temperature. See Refrigerant Charge section on page 27 for procedure to check and adjust R-22 charge.

C. Unit Controls

Compressor Overload

All compressors have an internal overcurrent protection device located inside of the compressor. This overload interrupts power to the compressor when the current becomes excessive, and automatically resets when the temperature drops to a safe level.

Unit Sizes 018-042 Only:

The compressor also has an overtemperature protection device (DT) located externally on the compressor. This overload interrupts power to the compressor when the temperature becomes excessive, and automatically resets when the temperature drops to a safe level.

These overloads may require up to 60 minutes (or longer) to reset; therefore, if either overload is suspected of being open, disconnect the electrical power to the unit and check the circuit through the overload with an ohmmeter or continuity tester.

High-Pressure Relief Valve (Unit Sizes 048,060 Only)

Valve opens when the pressure differential between the low and high side becomes excessive.

Seasonal Energy Efficiency Rating (SEER) Improvement Relay

The unit is equipped with a SEER improvement time-delay relay, which will hold the evaporator-fan contactor in for 45 seconds for unit sizes 018-042 and 30 seconds for unit sizes 048 and 060 when the call for cooling is satisfied. This time allows the air to absorb additional cooling from the cooling coil.

Controls Kits (Accesssory)

Low-Pressure Switch (LPS) Kit — When the refrigerant low-side pressure drops below 27 psig, the LPS opens 24-v power to the compressor contactor and stops the compressor. When the pressure reaches 60 psig, the switch resets and the compressor is allowed to come back on.

High-Pressure Switch (HPS) Kit — When the refrigerant high-side pressure reaches 428 psig, the HPS opens 24-v power to the compressor contactor and stops the compressor. When the pressure drops to 320 psig, the switch resets and the compressor is allowed to restart.

D. Cooling Sequence of Operation

Unit Sizes 018-042:

With the room thermostat SYSTEM switch in the COOL position and the FAN switch in the AUTO. position, the cooling sequence of operation is as follows:

When the room temperature rises to a point that is slightly above the cooling control setting of the thermostat, the thermostat completes the circuit between thermostat terminal R to terminals Y and G. These completed circuits through the thermostat connect contactor coil C (through unit wire Y) and relay coil IFR1 (through unit wire G) across the 24-v secondary of transformer (TRAN).

The normally open contacts of energized contactor C close and complete the circuit through compressor motor (COMP) and condenser-fan motor (OFM). Both motors start instantly.

The set of normally-open contacts of energized relay IFR1 closes and completes the circuit through evaporator blower motor IFM. The blower motor starts instantly.

NOTE: Once the compressor has started and then has stopped, it cannot be started again until 5 minutes have elapsed.

NOTE: The cooling cycle remains "on" until the room temperature drops to point that is slightly below the cooling control setting of the room thermostat. At this point, the thermostat "breaks" the circuit between thermostat terminal R to terminals Y and G. These open circuits deenergize C and IFR. The condenser and compressor motors stop, and after a 45-second delay, the blower motor stops. The unit is in a "standby" condition, waiting for the next "call for cooling" from the room thermostat.

Unit Sizes 048,060:

On a call for cooling, 24 v is supplied to the compressor contactor (C) and indoor fan relay (IFR) simultaneously through the "Y" and "G" terminals of the thermostat, respectively. Energizing the contactor closes the normally open set of contacts supplying power to both the compressor and outdoor fan motor (OFM). Energizing the IFR closes the normally open set of contacts providing power to the IFM. On the loss of the call for cooling, 24 v is removed from both the "Y" and "G" terminals of the thermostat (providing the fan switch is in the "Auto" position), deenergizing the compressor contactor opening the contacts supplying power to compressor and OFM. The IFM will continue to operate for 30 seconds.

NOTE: Once the compressor has started and then stopped, it cannot be restarted again until 5 minutes have elapsed.

NOTE: The cooling cycle remains "on" until the room temperature drops to point that is slightly below the cooling control setting of the room thermostat. At this point, the thermostat "breaks" the circuit between thermostat terminal R to terminals Y and G. These open circuits deenergize C and IFR1. The condenser and compressor motors stop, and after a 30-second delay, the blower motor stops. The unit is in a "standby" condition, waiting for the next "call for cooling" from the room thermostat.

III. INDOOR AIRFLOW AND AIRFLOW ADJUSTMENTS

CAUTION: For cooling operation, the recommended airflow is 350 to 450 cfm for each 12,000 Btuh of rated cooling capacity. For heating operation, the airflow must produce a temperature rise that falls within the range stamped on the unit rating plate.

WARNING: Shut off gas supply, then disconnect electrical power to the unit before changing blower speed. Electrical shock can cause personal injury or death.

Blower motors are factory-connected to deliver the proper heating and cooling airflows at normal external static pressures (medium speed cooling, low speed heating for 230-v units).

For 208-v operation on 208/230-v units, interchange motor leads to high speed for cooling and medium speed for heating operation.

Table 7 shows the temperature rise at various airflow rates. Tables 8A, 8B, 9A and 9B show both heating and cooling airflows at various external static pressures. Refer to these tables to determine the airflow for the system being installed. See Table 10 for wet coil pressure drop.

NOTE: Be sure that all supply- and return-air grilles are open, free from obstructions, and adjusted properly.

The heating and/or cooling airflow of 208/230-v blower motors can be changed by changing the lead connections of the blower motor. The motor leads are color-coded as follows:

red — low speed
blue — medium speed
black — high speed

A. Adjust Evaporator-Fan Speed

Unit Sizes 018-042:

The red motor lead connected to the heat relay (L) on PC1 blower control determines the heating speed and resulting airflow; and the blue motor lead connected to the cooling relay (H) on PC1 blower control determines the cooling speed and resulting airflow. See the unit wiring label.

To change the heating and/or cooling speed of a motor, connect the appropriate color-coded lead at blower motor connector to speed tap desired. (See unit wiring label.)

Unit Size 048:

To change heating and cooling speed for unit size 048, connect the black lead at blower-motor connector to speed tap desired. See unit wiring label.

Unit Size 060:

Adjust evaporator-fan speed to meet jobsite conditions. Tables 8A, 8B, 9A and 9B show fan rpm at motor pulley settings for standard and alternate motors. Refer to these tables to determine fan speed settings.

Fan motor pulleys are factory set for 3 turns open. Check pulley alignment and belt tension prior to start-up.

NOTE: Before adjusting fan speed, make sure the new fan speed will provide an air temperature rise range as shown below:

587A UNIT SIZE	AIR TEMP RISE RANGE (°F)
060080	20-50
060100	30-60
060120	35-65

To change fan speed:

1. Shut off unit power supply.
2. Loosen belt by loosening fan motor mounting nuts.
3. Loosen movable pulley flange setscrew (see Fig. 17).
4. Screw movable pulley flange toward fixed flange to increase speed and away from fixed flange to decrease speed. Increasing fan speed increases load on motor. Do not exceed 1500 rpm.
5. Set movable flange at nearest keyway of pulley hub and tighten setscrew. (See Tables 8A, 8B, 9A, and 9B for speed change for each full turn of pulley flange.)

To align fan and motor pulleys:

1. Loosen fan pulley setscrews.
2. Slide fan pulley along fan shaft.
3. Make angular alignment by loosening motor from mounting.

To adjust belt tension:

1. Loosen fan motor mounting nuts.
2. Slide motor mounting plate away from fan scroll for proper belt tension (1/2-in. deflection with one finger) and tighten mounting nuts. Tension can be applied using 1/2-in. drive ratchet engaged into 1/2-in. square hole on motor mounting plate.
3. Adjust lock bolt and nut on mounting plate to secure motor in fixed position.

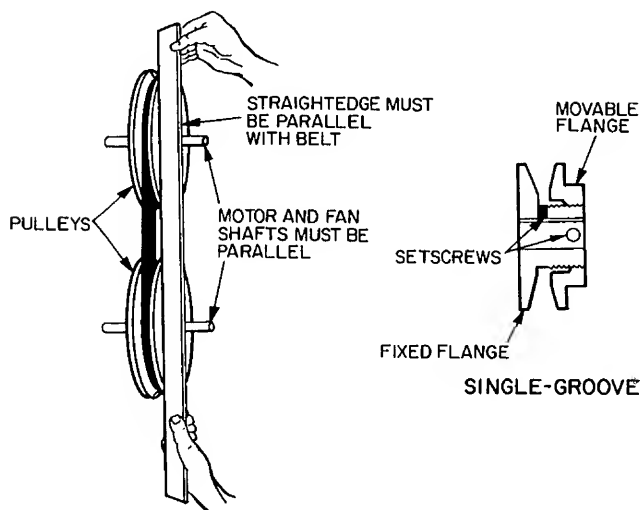


Fig. 17 — Evaporator-Fan Pulley Adjustment

Table 7 – Air Delivery (Cfm) at Indicated Temperature Rise and Rated Heating Input

UNIT 587A	HEATING INPUT (Btuh)	TEMPERATURE RISE (°F)												
		20	25	30	35	40	45	50	55	60	65	70	75	80
018040, 024040, 030040	40,000	—	—	987	846	740	658	592	538	493	—	—	—	—
024060, 030060, 036060	60,000	—	—	—	—	—	987	888	808	740	683	634	592	—
042060	60,000	—	—	1481	1269	1111	987	888	808	740	—	—	—	—
030080, 036080, 042080	80,000	—	—	—	—	—	1316	1185	1077	987	911	846	790	—
036096, 042096	96,000	—	—	—	—	1777	1580	1422	1292	1185	1096	1015	—	—
048080	80,000	—	2370	1975	1693	1481	1316	1185	1077	—	—	—	—	—
048100	100,000	—	—	—	2116	1851	1646	1481	1346	1234	1139	—	—	—
048120	120,000	—	—	—	—	—	—	1777	1616	1481	1367	1269	1185	1111
060080	80,000	2962	2370	1975	1693	1481	1316	1185	—	—	—	—	—	—
060100	100,000	—	—	2469	2116	1851	1646	1481	1346	1234	—	—	—	—
060120	120,000	—	—	—	2539	2222	1975	1777	1616	1481	1367	—	—	—

NOTE: Dashed areas do not fall within the approved temperature rise range of the unit.

Table 8A – Dry-Coil Air Delivery* – Horizontal Discharge at 208 V

587A	MOTOR SPEED	AIR DELIVERY	EXTERNAL STATIC PRESSURE (in. wg)										
			0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
018040	Low	Watts	310	280	245	230	210	200	†	†	†	†	†
		Cfm	994	909	779	674	539	444	†	†	†	†	†
	High	Watts	350	325	305	285	260	240	†	†	†	†	†
		Cfm	1054	989	884	764	624	469	†	†	†	†	†
024040, 024060	Low	Watts	451	427	407	383	365	348	328	309	288	275	258
		Cfm	1185	1129	1088	1026	979	922	857	796	734	670	606
	High	Watts	511	483	464	440	420	402	383	366	347	328	313
		Cfm	1370	1291	1221	1142	1063	1003	920	840	759	679	600
030040, 030060	Low	Watts	519	507	492	477	455	431	416	397	378	358	336
		Cfm	1184	1163	1150	1134	1105	1064	1038	1001	963	924	882
	High	Watts	620	602	581	559	532	493	492	470	448	426	403
		Cfm	1443	1414	1376	1329	1279	1197	1157	1090	1020	950	875
030080, 036060, 036080, 042060, 042080	Low	Watts	560	544	527	505	482	461	436	411	384	356	330
		Cfm	1515	1452	1389	1308	1227	1105	1019	906	787	659	523
	High	Watts	670	650	631	602	573	542	506	469	431	395	353
		Cfm	1765	1705	1621	1521	1383	1254	1098	931	760	579	392
036096, 042096	Low	Watts	873	847	814	785	758	734	692	660	626	595	560
		Cfm	1717	1690	1645	1597	1550	1496	1432	1368	1301	1233	1162
	High	Watts	1075	1030	995	960	930	900	872	843	817	790	762
		Cfm	2119	2062	1995	1913	1863	1793	1752	1642	1569	1491	1415
048080, 048100, 048120	Low	Watts	770	730	690	650	610	575	531	489	445	402	356
		Cfm	1945	1880	1796	1708	1611	1508	1384	1252	1111	961	801
	High	Watts	850	810	770	730	690	655	611	572	532	493	455
		Cfm	2138	2045	1943	1846	1738	1624	1494	1372	1244	1114	980

587A	MOTOR PULLEY TURNS OPEN	MOTOR RPM	AIR DELIVERY	EXTERNAL STATIC PRESSURE (in. wg)										
				0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
060080, 060100, 060120	0	1195	Watts	†	1175	1160	1125	1075	1020	1000	975	940	900	860
			Cfm	†	2325	2270	2200	2110	2025	1960	1900	1825	1690	1600
	1	1125	Watts	1130	1090	1060	1020	980	925	900	875	830	795	†
			Cfm	2400	2320	2265	2180	2100	2000	1910	1850	1740	1620	†
	2	1055	Watts	1015	990	950	900	860	840	800	760	730	700	†
			Cfm	2365	2310	2240	2130	2040	1950	1840	1740	1640	1510	†
	3	985	Watts	875	850	820	790	740	700	670	640	†	†	†
			Cfm	2300	2260	2130	2070	1900	1800	1675	1580	†	†	†
	4	915	Watts	775	750	720	675	650	625	580	†	†	†	†
			Cfm	2230	2175	2025	1900	1800	1675	1525	†	†	†	†
	5	845	Watts	650	640	620	580	550	†	†	†	†	†	†
			Cfm	2090	2010	1880	1760	1615	†	†	†	†	†	†

*Air delivery values are without air filter and are for dry coil. See Table 10 for wet coil pressure drop. Deduct field-supplied air filter pressure drop and wet coil pressure drop to obtain external static pressure available for ducting.
†Unit air delivery is outside of operating range

NOTES:

- Do not operate the unit at a cooling airflow that is less than 350 cfm for each 12,000 Btuh of rated cooling capacity. Evaporator-coil icing may occur at airflows below this point. Water blow-off may occur at airflows above 450 cfm per 12,000 Btuh of rated cooling capacity.
- Fan speed is based on pulley ratios and motor nameplate speed of 1580 rpm.

Table 8B — Dry-Coil Air Delivery* — Horizontal Discharge at 230 V

587A	MOTOR SPEED	AIR DELIVERY	EXTERNAL STATIC PRESSURE (in. wg)										
			0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
018040	Low	Watts	335	305	275	255	235	225	†	†	†	†	†
		Cfm	1014	919	779	691	554	454	†	†	†	†	†
	High	Watts	380	370	345	330	310	295	†	†	†	†	†
		Cfm	1059	989	889	779	639	519	†	†	†	†	†
024040, 024060	Low	Watts	501	477	457	433	415	398	375	356	336	313	298
		Cfm	1256	1195	1148	1081	1031	971	907	844	781	717	652
	High	Watts	561	533	514	490	470	452	428	408	389	371	353
		Cfm	1442	1359	1285	1202	1119	1056	950	865	777	690	600
030040, 030060	Low	Watts	569	557	542	527	505	481	445	413	373	338	295
		Cfm	1248	1226	1211	1194	1164	1120	1066	1004	934	858	776
	High	Watts	670	652	631	609	582	543	525	493	461	430	397
		Cfm	1519	1489	1449	1399	1347	1261	1222	1154	1057	1010	935
030080, 036060, 036080, 042060, 042080	Low	Watts	610	593	575	524	500	494	467	436	406	375	344
		Cfm	1597	1530	1464	1378	1293	1164	1043	921	794	665	531
	High	Watts	720	701	680	653	625	594	564	532	500	467	434
		Cfm	1857	1795	1708	1603	1457	1321	1161	990	809	610	426
036096, 042096	Low	Watts	987	945	911	877	850	809	774	740	708	676	650
		Cfm	1979	1922	1859	1802	1734	1667	1594	1522	1450	1376	1303
	High	Watts	1121	1087	1046	1017	981	952	925	900	877	854	831
		Cfm	2135	2066	1998	1931	1858	1795	1717	1646	1570	1494	1420
048080, 048100, 048120	Low	Watts	810	765	730	695	655	610	563	512	458	402	343
		Cfm	2061	1970	1892	1813	1704	1580	1444	1240	1113	928	723
	High	Watts	890	855	820	780	750	715	675	639	600	563	526
		Cfm	2178	2081	1941	1869	1769	1650	1530	1408	1280	1153	1021

587A	MOTOR PULLEY TURNS OPEN	MOTOR RPM	AIR DELIVERY	EXTERNAL STATIC PRESSURE (in. wg)										
				0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
060080, 060100, 060120	0	1195	Watts	†	†	1320	1260	1210	1175	1140	1110	1070	1020	960
			Cfm	†	†	2425	2375	2260	2185	2125	2075	1975	1850	1750
	1	1125	Watts	†	1200	1150	1120	1075	1050	1000	960	920	875	830
			Cfm	†	2480	2385	2310	2225	2125	2040	1950	1825	1700	1575
	2	1055	Watts	1055	1025	990	975	930	900	840	820	780	750	†
			Cfm	2450	2375	2260	2210	2100	2010	1890	1790	1675	1540	†
	3	985	Watts	950	930	900	860	820	780	750	725	†	†	†
			Cfm	2360	2280	2200	2100	2000	1890	1760	1640	†	†	†
	4	915	Watts	840	820	775	750	720	670	640	†	†	†	†
			Cfm	2260	2170	2060	1940	1840	1690	1540	†	†	†	†
	5	845	Watts	715	700	660	630	600	590	†	†	†	†	†
			Cfm	2100	2040	1870	1790	1640	1540	†	†	†	†	†

*Air delivery values are without air filter and are for dry coil. See Table 10 for wet coil pressure drop. Deduct field-supplied air filter pressure drop and wet coil pressure drop to obtain external static pressure available for ducting
†Unit air delivery is outside of operating range.

NOTES:

1. Do not operate the unit at a cooling airflow that is less than 350 cfm for each 12,000 Btuh of rated cooling capacity. Evaporator-coil icing may occur at airflows below this point. Water blow-off may occur at airflows above 450 cfm per 12,000 Btuh of rated cooling capacity
2. Fan speed is based on pulley ratios and motor nameplate speed of 1580 rpm

Table 9A — Dry-Coil Air Delivery* — Downflow Discharge at 208 V

587A	MOTOR SPEED	AIR DELIVERY	EXTERNAL STATIC PRESSURE (in. wg)										
			0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
018040	Low	Watts	320	290	255	240	220	210	†	†	†	†	†
		Cfm	1005	920	790	685	550	455	†	†	†	†	†
	High	Watts	350	335	315	295	270	256	†	†	†	†	†
		Cfm	1065	1000	895	775	635	480	†	†	†	†	†
024040, 024060	Low	Watts	451	417	397	373	355	338	320	307	292	277	263
		Cfm	1138	1102	1045	996	942	889	835	770	708	645	580
	High	Watts	491	463	454	420	400	382	351	330	306	282	263
		Cfm	1308	1234	1162	1084	1020	951	879	809	740	670	602
030040, 030060	Low	Watts	509	497	482	467	445	421	377	351	316	282	250
		Cfm	1155	1138	1120	1104	1073	1031	977	942	893	842	790
	High	Watts	600	582	561	539	512	473	430	381	333	285	243
		Cfm	1411	1362	1326	1249	1195	1133	1078	1012	950	887	820
030080, 036060, 036080, 042060, 042080	Low	Watts	522	504	485	463	440	422	398	379	357	335	314
		Cfm	1494	1430	1358	1273	1174	1058	941	820	691	561	429
	High	Watts	651	631	610	575	540	517	493	466	442	417	395
		Cfm	1683	1615	1536	1440	1274	1153	997	826	644	460	270
036096, 042096	Low	Watts	833	792	765	725	700	650	615	570	537	509	481
		Cfm	1653	1611	1569	1518	1473	1373	1297	1212	1125	1035	939
	High	Watts	945	915	890	865	805	770	712	652	590	527	466
		Cfm	1895	1839	1803	1740	1629	1532	1400	1264	1119	963	801
048080, 048100, 048120	Low	Watts	710	680	650	600	570	520	478	428	388	343	302
		Cfm	1833	1768	1700	1599	1505	1390	1275	1154	1031	903	772
	High	Watts	785	750	720	685	650	610	588	543	506	471	436
		Cfm	1957	1873	1786	1699	1598	1495	1393	1292	1189	1084	977

587A	MOTOR PULLEY TURNS OPEN	MOTOR RPM	AIR DELIVERY	EXTERNAL STATIC PRESSURE (in. wg)										
				0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
060080, 060100, 060120	0	1195	Watts	1175	1160	1125	1075	1020	1000	975	940	900	860	†
			Cfm	2325	2270	2200	2110	2025	1960	1900	1825	1690	1600	†
	1	1125	Watts	1090	1060	1020	980	925	900	875	830	795	†	†
			Cfm	2320	2265	2180	2100	2000	1910	1850	1740	1620	†	†
	2	1055	Watts	990	950	900	860	840	800	760	730	700	†	†
			Cfm	2310	2240	2130	2040	1950	1840	1740	1640	1510	†	†
	3	985	Watts	850	820	790	740	700	670	640	†	†	†	†
			Cfm	2260	2130	2070	1900	1800	1675	1580	†	†	†	†
	4	915	Watts	750	720	675	650	625	580	†	†	†	†	†
			Cfm	2175	2025	1900	1800	1675	1525	†	†	†	†	†
	5	845	Watts	640	620	580	550	†	†	†	†	†	†	†
			Cfm	2010	1880	1760	1615	†	†	†	†	†	†	†

*Air delivery values are for without air filter and are for dry coil. See Table 10 for wet coil pressure drop. Deduct field-supplied air filter pressure drop and wet coil pressure drop to obtain external static pressure available for ducting

†Unit air delivery is outside of operating range

NOTES:

1. Do not operate the unit at a cooling airflow that is less than 350 cfm for each 12,000 Btuh of rated cooling capacity. Evaporator-coil icing may occur at airflows below this point. Water blow-off may occur at airflows above 450 cfm per 12,000 Btuh of rated cooling capacity.
2. Fan speed is based on pulley ratios and motor nameplate speed of 1580 rpm

Table 9B — Dry-Coil Air Delivery* — Downflow Discharge at 230 V

587A	MOTOR SPEED	AIR DELIVERY	EXTERNAL STATIC PRESSURE (in. wg)										
			0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
018040	Low	Watts	345	315	285	265	245	235	†	†	†	†	†
		Cfm	1025	930	790	700	565	465	†	†	†	†	†
	High	Watts	390	380	355	340	320	305	†	†	†	†	†
		Cfm	1070	1000	900	790	650	530	†	†	†	†	†
024040, 024060	Low	Watts	491	467	447	423	405	388	371	354	336	323	307
		Cfm	1196	1161	1101	1050	993	932	873	806	740	672	601
	High	Watts	541	513	494	470	450	432	417	401	386	370	354
		Cfm	1379	1301	1225	1143	1075	1002	940	879	806	741	678
030040, 030060	Low	Watts	559	547	532	517	495	471	436	400	360	319	275
		Cfm	1218	1200	1182	1165	1132	1088	1035	976	909	836	761
	High	Watts	650	632	611	589	562	523	520	498	474	451	429
		Cfm	1493	1457	1412	1358	1274	1218	1125	1032	938	838	732
030080, 036060, 036080, 042060, 042080	Low	Watts	600	573	555	523	491	470	431	398	369	339	313
		Cfm	1574	1507	1431	1341	1237	1115	959	841	700	550	395
	High	Watts	695	680	658	624	590	563	525	484	446	407	367
		Cfm	1763	1700	1619	1492	1343	1215	1032	844	649	443	235
036096, 042096	Low	Watts	880	850	810	790	745	710	670	630	591	551	511
		Cfm	1805	1748	1692	1650	1582	1475	1396	1301	1198	1093	985
	High	Watts	1005	965	935	900	865	820	886	747	710	674	635
		Cfm	1971	1899	1830	1762	1673	1568	1476	1371	1260	1146	1025
048A80, 048100, 048120	Low	Watts	740	705	665	635	600	560	525	488	452	418	381
		Cfm	1918	1849	1752	1670	1561	1442	1321	1194	1062	930	790
	High	Watts	835	805	770	735	705	670	633	597	562	525	490
		Cfm	1997	1907	1817	1713	1618	1506	1388	1273	1160	1040	920

587A	MOTOR PULLEY TURNS OPEN	MOTOR RPM	AIR DELIVERY	EXTERNAL STATIC PRESSURE (in. wg)										
				0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
060080, 060100, 060120	0	1195	Watts	†	1320	1260	1210	1175	1140	1110	1070	1020	960	940
			Cfm	†	2425	2375	2260	2185	2125	2075	1975	1850	1750	1660
	1	1125	Watts	1200	1150	1120	1075	1050	1000	960	920	875	830	†
			Cfm	2480	2385	2310	2225	2125	2040	1950	1825	1700	1575	†
	2	1055	Watts	1025	990	975	930	900	840	820	780	750	†	†
			Cfm	2375	2260	2210	2100	2010	1890	1790	1675	1540	†	†
	3	985	Watts	930	900	860	820	780	750	725	†	†	†	†
			Cfm	2280	2200	2100	2000	1890	1760	1640	†	†	†	†
	4	915	Watts	820	775	750	720	670	640	†	†	†	†	†
			Cfm	2170	2060	1940	1840	1690	1540	†	†	†	†	†
	5	845	Watts	700	660	630	600	590	†	†	†	†	†	†
			Cfm	2040	1870	1790	1640	1540	†	†	†	†	†	†

*Air delivery values are for without air filter and are for dry coil. See Table 10 for wet coil pressure drop. Deduct field-supplied air filter pressure drop and wet coil pressure drop to obtain external static pressure available for ducting.

†Unit air delivery is outside of operating range

NOTES:

1. Do not operate the unit at a cooling airflow that is less than 350 cfm for each 12,000 Btuh of rated cooling capacity. Evaporator-coil icing may occur at airflows below this point. Water blow-off may occur at airflows above 450 cfm per 12,000 Btuh of rated cooling capacity.
2. Fan speed is based on pulley ratios and motor nameplate speed of 1580 rpm

Table 10 — Wet Coil Pressure Drop

MODEL 587A	AIRFLOW (Cfm)	PRESSURE DROP (in. wg)
018, 024	450	.029
	600	.038
	700	.044
	800	.052
	900	.062
030	900	.042
	1000	.050
	1200	.064
036, 042	1000	.038
	1200	.050
	1400	.064
	1600	.080

MODEL 587A	AIRFLOW (Cfm)	PRESSURE DROP (in. wg)
048	1400	.050
	1600	.060
	1800	.072
060	1700	.100
	1900	.120
	2100	.140
	2300	.160

CARE AND MAINTENANCE

To ensure continuing high performance, and to minimize the possibility of premature equipment failure, periodic maintenance must be performed on this equipment. This combination heating/cooling unit should be inspected at least once each year by a qualified service person.

NOTE TO EQUIPMENT OWNER: Consult your local dealer about the availability of a maintenance contract.

⚠ WARNING: The ability to properly perform maintenance on this equipment requires certain expertise, mechanical skills, tools, and equipment. If you do not possess these, do not attempt to perform any maintenance on this equipment other than those procedures recommended in the User's Manual. **FAILURE TO HEED THIS WARNING COULD RESULT IN SERIOUS PERSONAL INJURY AND POSSIBLE DAMAGE TO THIS EQUIPMENT.**

The minimum maintenance requirements for this equipment are as follows:

1. Inspect air filter(s) each month. Clean or replace when necessary.
2. Inspect indoor coil, drain pan and condensate drain each cooling season for cleanliness. Clean when necessary.
3. Inspect blower motor and wheel for cleanliness, and check lubrication each heating and cooling season. Clean and lubricate (if required) when necessary.
4. Check electrical connections for tightness and controls for proper operation each heating and cooling season. Service when necessary.
5. Check and inspect heating section before each heating season. Clean and adjust when necessary.
6. Check and clean vent screen, if needed.

⚠ WARNING: Failure to follow these warnings could result in serious personal injury:

1. Turn off gas supply, *then* turn off electrical power to the unit before performing any maintenance or service on the unit.
2. Use extreme caution when removing panels and parts. As with any mechanical equipment, personal injury can result from sharp edges, etc.
3. Never place anything combustible either on, or in contact with, the unit.
4. Should overheating occur, or the gas supply fail to shut off, shut off the external main manual gas valve to the unit, *then* shut off the electrical supply.

I. AIR FILTER

⚠ CAUTION: Never operate the unit without a suitable air filter in the return-air duct system. Always replace the filter with the same dimensional size and type as originally installed. See Table 1 for recommended filter sizes.

Inspect air filter(s) at least once each month and replace (disposable-type) or clean (cleanable-type) at least twice during each heating and cooling season or whenever the filter(s) becomes clogged with dust and lint.

II. EVAPORATOR BLOWER AND MOTOR

NOTE: Motors without oilers are permanently lubricated. Do not attempt to lubricate these motors.

For longer life, operating economy and continued efficiency, clean accumulated dirt and grease from the blower wheel and motor annually.

Lubricate the motor every 5 years if the motor is used intermittently (thermostat FAN switch in AUTO. position), or every 2 years if the motor is used continuously (thermostat FAN switch in ON position).

⚠ WARNING: Turn off the gas supply, *then* disconnect and tag electrical power to the unit before cleaning and lubricating the blower motor and wheel. Failure to adhere to this warning could cause personal injury or death.

Clean and lubricate the blower motor and wheel as follows for direct-drive models (unit sizes 018-048):

1. Remove and disassemble blower assembly as follows:
 - a. Remove blower access door.
 - b. Disconnect blower-motor leads from their termination points at motor. Disconnect yellow lead from control box at capacitor. Disconnect auxiliary limit switch leads at switch.
 - c. Remove blower assembly from unit. Be careful not to tear insulation in blower compartment.
 - d. Ensure proper reassembly by marking blower wheel and motor in relation to blower housing before disassembly.
 - e. Loosen setscrew(s) that secures wheel to motor shaft. Then remove screws that secure motor mount brackets to housing and slide motor and motor mount out of housing.
2. Lubricate motor as follows:
 - a. Thoroughly clean all accumulations of dirt or grease from motor housing.
 - b. Remove dust caps or plugs from oil ports located at each end of motor.
 - c. Use a good grade of SAE 20 nondetergent motor oil and put one teaspoon (5 cc, $\frac{3}{16}$ ounce or 16 to 25 drops) in each oil port.
 - d. Allow time for oil to be absorbed by each bearing, then wipe excess oil from motor housing.
 - e. Replace dust caps or plugs in oil ports.
3. Remove and clean blower wheel as follows:
 - a. Ensure proper reassembly by marking wheel orientation and cutoff plate location.
 - b. Remove screws holding cutoff plate, and remove plate from housing.
 - c. Lift wheel from housing. When handling and/or cleaning blower wheel, be sure not to disturb balance weights (clips) on blower-wheel vanes.
 - d. Remove caked-on dirt from wheel and housing with a brush. Remove lint and/or dirt accumulations from wheel and housing with vacuum cleaner, using soft brush attachment. Remove grease and oil with mild solvent.
 - e. Reassemble wheel and cutoff plate into housing.
 - f. Reassemble motor into housing. Be sure setscrews are tightened on motor shaft flats and not on round part of shaft.

Clean and lubricate the blower motor and wheel as follows for belt-drive models (unit size 060):

1. Remove blower assembly as follows:
 - a. Remove blower access door from unit.
 - b. Disconnect auxiliary limit switch leads as switch.
 - c. Remove blower assembly and motor from unit. Be careful not to tear insulation in blower compartment. Support assembly to prevent damage to motor leads.
2. Lubricate motor as follows:
 - a. Thoroughly clean all accumulations of dirt or grease from motor housing.
 - b. Remove dust caps or plugs from oil ports located at each end of motor.
 - c. Use a good grade of SAE 20 nondetergent motor oil and put one teaspoon (5cc, 3/16 oz., or 16 to 25 drops) in each oil port.
 - d. Allow time for oil to be absorbed by each bearing, then wipe excess oil from motor housing.
 - e. Replace dust caps or plugs in oil ports.
3. Remove and clean blower wheel as follows:
 - a. Remove blower belt, then remove blower pulley.
 - b. Remove blower-shaft bearing locking collars.
 - c. Loosen blower wheel setscrew, then pull blower shaft from wheel.
 - d. Remove screws holding cutoff plate, then remove cutoff plate.
 - e. Lift wheel from housing. When handling and/or cleaning, be sure not to disturb balance weights on blower wheel vanes.
 - f. Remove caked-on dirt from wheel and housing with a brush. Remove lint and/or dirt accumulations from wheel and housing with vacuum cleaner, using soft brush attachment. Remove grease and oil with mild solvent.
 - g. Reassemble wheel and cutoff plate into housing.
 - h. Reinstall blower shaft, bearing locking collars, blower pulley, and belt.
4. Reinstall blower assembly into unit, route blower motor leads into control compartment, and reconnect all blower motor leads. Replace panels.
5. Restore electrical power, then gas supply to unit. Start unit and check for proper blower rotation and motor speeds during heating and cooling cycles.

SERVICE

⚠ WARNING: When servicing unit, shut off gas supply then shut off all electrical power to unit to avoid shock hazard or injury from rotating parts.

I. CLEANING

Inspect unit interior at the beginning of each heating and cooling season or as operating conditions require. To inspect and clean, the unit top must be removed.

A. Unit Top Removal

⚠ CAUTION: Condenser fan and motor are fastened to the unit top. When removing the top, use extreme care to not pull the fan motor leads loose.

NOTE: When performing maintenance or service procedures that require removal of the unit top, be sure to perform *all* of the routine maintenance procedures that require top re-

moval, including: inspection of the heat exchanger area, coil inspection and cleaning, and condensate drain pan inspection and cleaning.

Only qualified service personnel should perform maintenance and service procedures that require unit top removal. Refer to the following top removal procedures:

1. Turn off gas supply, *then* turn off electric power to unit.
2. Remove all screws that secure unit top, including screws around 4 sides and those on top that screw into internal divider panels. Save all screws.
3. Tape all side panels at each seam near unit top. Use tape strips that are at least 5 in. long to prevent sides from falling when top is removed.
4. Lift top from unit carefully. Set top on edge and ensure that top is supported by unit side that is opposite duct (or plenum) side. *Use extreme care to prevent damage to the fan blades, motor and insulation.*
5. Carefully replace and secure unit top to unit, using screws removed in Step 2, when maintenance and/or service procedures are concluded. (Be sure to use original screws that have rubber washers to seal out water when securing top to internal divider panels.)

B. Repairing Refrigerant Leaks

Proceed as follows to repair a refrigerant leak and to charge the unit.

1. Locate leak and ensure that refrigerant system pressure has been relieved and reclaimed from both high- and low-pressure ports.
2. Repair leak following accepted practices.

NOTE: Install a filter drier whenever the system has been opened for repair.

3. Add a small charge of R-22 refrigerant vapor to system and leak-test unit.
4. Evacuate and reclaim refrigerant from refrigerant system if additional leaks are not found.
5. Charge unit with R-22 refrigerant, using a volumetric-charging cylinder or accurate scale. *Refer to unit rating plate for required charge.* Be sure to add extra refrigerant to compensate for internal volume of filter drier.

NOTE: See Checking and Adjusting Refrigerant Charge on page 18.

C. Condenser Coil, Evaporator Coil and Condensate Drain Pan

Inspect the condenser coil, evaporator coil and condensate drain pan at least once each year. Proper inspection and cleaning requires the removal of the unit top. See Unit Top Removal section above.

The coils are easily cleaned when dry; therefore, inspect and clean the coils either before or after each cooling season. Remove all obstructions, including weeds and shrubs that interfere with the airflow, through the condenser coil. Straighten bent fins with a fin comb. If coated with dirt or lint, clean the coils with a vacuum cleaner, using the soft brush attachment. Be careful not to bend the fins. If coated with oil or grease, clean the coils with a mild detergent-and-water solution. Rinse coils with clear water, using a garden hose. Be careful not to splash water on motors, insulation, wiring or air filter(s). For best results, spray condenser coil fins from inside to outside the unit. On units with an outer and inner condenser coil, be sure to clean between the coils. Be sure to flush all dirt and debris from the unit base.

Inspect the drain pan and condensate drain line when inspecting the coils. Clean the drain pan and condensate drain

by removing all foreign matter from the pan. Flush the pan and drain tube with clear water. Do not splash water on the insulation, motor, wiring or air filter(s). If the drain tube is restricted, clear it with a "plumbers snake" or similar probe device.

D. Condenser Fan

CAUTION: Keep the condenser fan free from all obstructions to ensure proper cooling operation. Never place articles on top of the unit. Damage to unit may result.

Remove control and compressor access panels. Inspect the fan blades for cracks or bends each year. *Ensure that blades clear the motor by no more than 1/4 inch.* If the blade assembly has slipped down the motor shaft, adjust the fan position on the motor shaft by loosening the setscrew, then moving the blade assembly up. Be sure that the setscrew is on the flat of the motor shaft before tightening.

E. Pilot

Inspect the pilot and clean (when necessary) at the beginning of each heating season. Remove the accumulation of soot and carbon from the pilot. The pilot flame must be high enough for proper contact with the flame sensor. Pilot flame also must come in contact with the pilot hood (target) for proper operation. If the pilot flame appears too hard (lifting and blowing) or too soft (unstable), check inlet gas pressure for proper value. See Table 6. The spark electrode must be located so the spark travels through a combustible mixture of gas. If necessary, readjust the electrode as shown in Fig. 18; be certain to maintain the 1/8-in. spark gap.

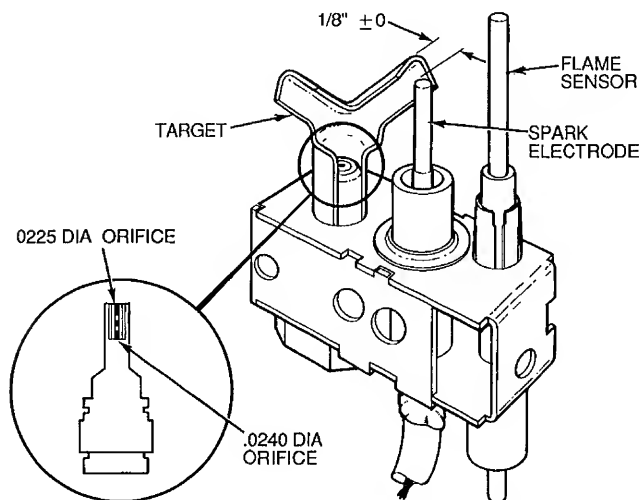


Fig. 18 — Position of Electrode to Pilot

F. Electrical Controls and Wiring

Inspect and check the electrical controls and wiring annually. *Be sure to turn off the gas supply and then the electrical power to the unit.*

Remove the control, blower and compressor compartment access panels to locate all the electrical controls and wiring. Check all electrical connections for tightness. Tighten all screw connections. If any smoky or burned connections are noticed, disassemble the connection and clean all the parts. Then restrip the wire end, and reassemble the connection properly and securely.

After inspecting the electrical controls and wiring, replace all of the panels. Start the unit, and observe at least one complete heating cycle and one complete cooling cycle to ensure proper operation. If discrepancies are observed in either or

both operating cycles, or if a suspected malfunction has occurred, check each electrical component with the proper electrical instrumentation. Refer to the unit wiring label when making these checkouts.

NOTE: Refer to the heating and/or cooling sequence of operation in this publication as an aid in determining proper control operation.

G. Gas Input

The gas input does not require checking unless improper heating performance is suspected. If a problem exists, refer to Adjusting Gas Input section on page 15.

H. Evaporator Airflow

The heating and/or cooling airflow does not require checking unless improper performance is suspected. *If a problem exists, be sure that all supply- and return-air grilles are open and free from obstructions, and that the air filter is clean.* When necessary, refer to Indoor Airflow and Airflow Adjustments section on page 19 to check the system airflow.

I. Metering Device Servicing

Unit Sizes 018-042 (AccuRater® Piston):

See Fig. 19 for metering device components. The piston has a refrigerant metering orifice through it. The retainer forms a sealing surface for liquid-line flare connection. To check, clean or replace piston:

1. Shut off power to unit.
2. Remove and reclaim refrigerant from unit using approved refrigerant removal methods.
3. Remove liquid-line flare connections from metering device.
4. Note position of arrow on metering device body with respect to unit.
5. Pull retainer out of body. Be careful not to scratch flare sealing surface. If retainer does not pull out easily, carefully use locking pliers to remove retainer. Replace scratched or damaged retainer.
6. Slide piston out by inserting a small, soft wire through metering hole (18-gage thermostat wire). See that metering hole, sealing surface around piston cones and fluted portion of piston are not damaged.
7. Chart on unit access panel illustrates proper arrangement and size of piston. See Table 1 for piston sizes.
8. Clean piston refrigerant metering orifice.
9. Replace retainer O-ring (part number 99CC501052).

Unit Sizes 048,060 (Actutrol™ Device):

This metering device is a fixed orifice and is located in the header to the evaporator coil.

J. Liquid Line Strainer

The liquid line strainer (to protect metering device) is made of wire mesh and located in the liquid line on inlet side. Strainer is pressed into the line. Remove strainer by threading a number-10 sheet metal screw into strainer and pulling the screw with pliers.

NOTE: Only the liquid line strainer on unit sizes 018-042 can be removed.

K. Heating Section

Ensure dependable and efficient heating operation by inspecting the heating section before each heating season, and cleaning when necessary.

Proceed as follows to inspect and clean heating section:

1. Turn off gas and power to unit.

2. Remove burner access door.
3. Disconnect 2 wires from inducer motor.
4. Remove complete inducer assembly from unit.
5. Remove screws that secure collector box to heat exchanger, exposing flue openings.
6. Remove flue choke.
7. Clean cells using field-provided, small wire brush, steel spring cable, reversible electric drill and vacuum cleaner.
 - a. Assemble wire brush and steel spring cable.
 - Use 4 ft of 1/4-in. diameter high-grade steel spring cable (commonly known as drain cleanout or Roto-Rooter cable).
 - Use 1/4-in. diameter wire brush (commonly known as 25-caliber rifle cleaning brush).

NOTE: The items called for above can be purchased at a local hardware store.

- (1.) Insert twisted wire end of brush into end of spring cable, and crimp tight with crimping tool or strike with ball-peen hammer. *Tightness is very important.*
- (2.) Remove metal sleeve from wire brush to allow proper brush action.
- b. Clean each heat exchanger cell.
 - (1.) Attach variable-speed reversible drill to end of spring cable (end opposite brush).
 - (2.) Insert brush end of cable into upper opening of cell and slowly rotate with drill. *Do not* force cable. Gradually insert at least 3 ft of cable into 2 upper passes of cell.
 - (3.) Work cable in and out of cell 3 or 4 times to obtain sufficient cleaning. *Do not* pull cable with great force. Reverse drill and gradually work cable out.
 - (4.) Remove burner assembly.
 - (5.) Insert brush end of cable in lower opening of cell, and proceed to clean in same manner.
 - (6.) Repeat above procedures until each cell in unit has been cleaned.
 - (7.) Using vacuum cleaner, remove residue from each cell.
 - (8.) Using vacuum cleaner with soft brush attachment, clean burner assembly.
 - (9.) Reinstall burner assembly.
8. After cleaning, check sealant and gaskets to ensure that they have not been damaged. If new sealants or gaskets are needed, contact your distributor.
9. Reinstall flue choke. Be sure all screws are in and tight.
10. Clean and replace flue collector assembly, making sure all screws are secure.
11. Replace inducer assembly.
12. Reconnect 2 wires to inducer motor.
13. Replace burner access door.
14. Turn on power and gas.
15. Set thermostat and check unit for proper operation.

II. REFRIGERANT CHARGE

Adjustment of the refrigerant charge is not required unless the unit is suspected of not having the proper R-22 charge.

A superheat charging label is attached to the outside of the compressor access door. The label includes a "Field Superheat Charging Table" and a "Required Suction-Tube Temperature (° F)" chart.

An accurate superheat-, thermocouple-, or thermistor-type thermometer, a sling psychrometer and a gage manifold are required when using the superheat charging method for evaluating the unit charge. *Do not use mercury or small dial-type thermometers — they are not adequate for this type of measurement.*

CAUTION: When evaluating the refrigerant charge, an indicated adjustment to the specified factory charge must always be very minimal. If a substantial adjustment is indicated, an abnormal condition exists somewhere in the cooling system, such as insufficient air flow across either coil or both coils.

Proceed as follows:

1. Remove caps from low- and high-pressure service fittings.
2. Using hoses with valve core depressors, attach low- and high-pressure gage hoses to low- and high-pressure service fittings, respectively.
3. Start unit in cooling mode and let unit run until system pressures stabilize.
4. Measure and record the following:
 - a. Outdoor ambient-air temperature (F db).
 - b. Evaporator inlet-air temperature (F wb).
 - c. Suction-tube temperature (F) at low-side service fitting.
 - d. Suction (low-side) pressure (psig).
5. Using "Field Superheat Charging Table," compare outdoor-air temperature (F db) with evaporator inlet-air temperature (F wb) to determine desired system operating superheat temperature. See Tables 11A-11C.
6. Next, using "Required Suction-Tube Temperature (F)" table, compare desired superheat temperature with suction (low-side) operating pressure (psig) to determine proper suction-tube temperature. See Table 12.
7. Compare actual suction-tube temperature with proper suction-tube temperature. Using a tolerance of $\pm 3^{\circ}$ F, add refrigerant if actual temperature is more than 3° F higher than proper suction-tube temperature; remove and reclaim refrigerant if actual temperature is more than 3° F lower than required suction-tube temperature.

NOTE: If the problem causing the inaccurate readings is a refrigerant leak, refer to Repairing Refrigerant Leaks section on page 25.

III. REPLACEMENT PARTS

A complete list of replacement parts may be obtained from your distributor upon request.

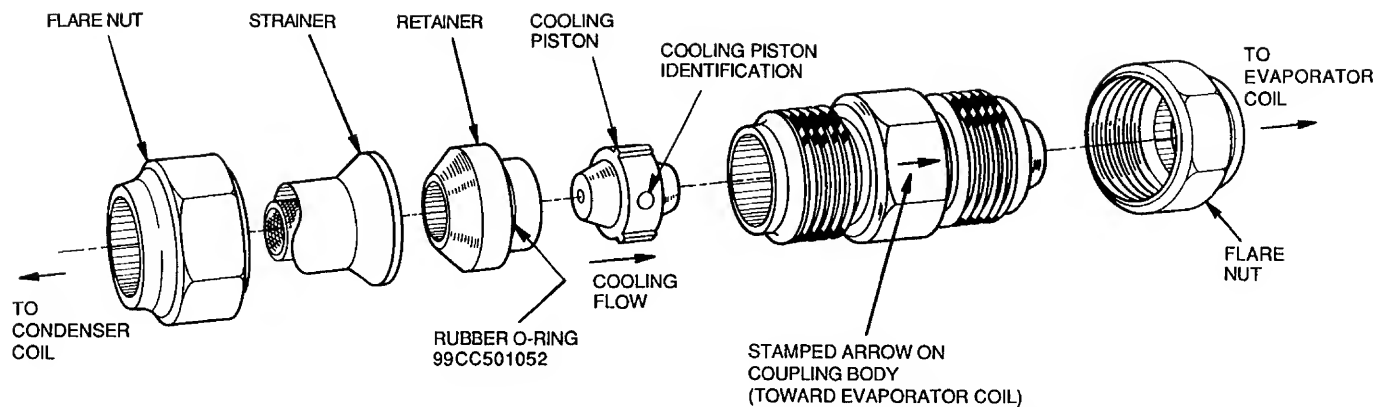


Fig. 19 — AccuRater® Metering Device Components (Unit Sizes 018-042 Only)

**Table 11A — Superheat Charging Table, 587A018-042
(Superheat Entering Suction Service Valve)**

OUTDOOR TEMP (F)	EVAPORATOR COIL ENTERING-AIR TEMPERATURE (F wb)													
	50	52	54	56	58	60	62	64	66	68	70	72	74	76
55	9	12	14	17	20	23	26	29	32	35	37	40	42	45
60	7	10	12	15	18	21	24	27	30	33	35	38	40	43
65	*	6	10	13	16	19	21	24	27	30	33	36	38	41
70	*	*	7	10	13	16	19	21	24	27	30	33	36	39
75	*	*	*	6	9	12	15	18	21	24	28	31	34	37
80	*	*	*	*	5	8	12	15	18	21	25	28	31	35
85	*	*	*	*	*	*	8	11	15	19	22	26	30	33
90	*	*	*	*	*	*	5	9	13	16	20	24	27	31
95	*	*	*	*	*	*	*	6	10	14	18	22	25	29
100	*	*	*	*	*	*	*	*	8	12	15	20	23	27
105	*	*	*	*	*	*	*	*	5	9	13	17	22	26
110	*	*	*	*	*	*	*	*	*	6	11	15	20	25
115	*	*	*	*	*	*	*	*	*	*	8	14	18	23

*Do not attempt to charge system under these conditions — refrigerant slugging may occur

**Table 11B — Superheat Charging Table, 587A048
(Superheat Entering Suction Service Port)**

Temp (F) Air Ent Cond		Evap Air — Cfm											
		1750											
		Evap Air — Ewb (F)											
		54	56	58	60	62	64	66	68	70	72	74	76
65	SPH	10.0	10.0	10.0	10.0	14.5	19.0	22.0	25.0	26.0	27.0	26.7	26.3
70	SPH	7.95	7.95	7.95	7.95	11.7	15.4	18.4	21.5	23.2	25.0	25.0	25.1
75	SPH	5.90	5.90	5.90	5.90	8.90	11.9	14.9	17.9	20.4	22.9	23.4	23.9
80	SPH	*	*	*	*	6.85	9.85	12.8	15.9	18.3	20.8	21.7	22.6
85	SPH	*	*	*	*	*	7.80	10.8	13.8	16.3	18.8	20.1	21.4
90	SPH	*	*	*	*	*	*	8.00	11.8	14.3	16.8	18.5	20.2
95	SPH	*	*	*	*	*	*	5.20	9.70	12.2	14.7	16.8	19.0
100	SPH	*	*	*	*	*	*	*	7.65	10.9	14.1	15.9	17.7
105	SPH	*	*	*	*	*	*	*	5.60	9.60	13.6	15.1	16.5
110	SPH	*	*	*	*	*	*	*	*	8.67	13.0	14.9	16.8
115	SPH	*	*	*	*	*	*	*	*	7.75	12.5	14.8	17.1

LEGEND

Ewb — Entering Wet Bulb

SPH — Superheat at Compressor (F)

*Do not attempt to charge system under these conditions — refrigerant slugging may occur.

**Table 11C — Superheat Charging Table, 587A060
(Superheat Entering Suction Service Port)**

Temp (F) Air Ent Cond		Evap Air — Cfm											
		2000											
		Evap Air — Ewb (F)											
		54	56	58	60	62	64	66	68	70	72	74	76
65	SPH	21.0	20.5	20.0	19.5	22.2	24.9	26.0	27.0	27.5	28.0	27.5	27.0
70	SPH	17.4	17.0	16.5	16.0	18.7	21.4	23.2	25.0	25.4	25.9	25.9	25.9
75	SPH	13.9	13.4	12.9	12.4	15.1	17.8	20.4	22.9	23.4	23.9	24.3	24.7
80	SPH	10.3	9.86	9.36	8.87	11.6	14.3	17.6	20.8	22.1	23.3	23.5	23.6
85	SPH	6.80	6.31	5.81	5.32	8.02	10.7	14.8	18.8	20.8	22.8	22.6	22.5
90	SPH	*	*	*	*	*	7.18	12.0	16.8	18.7	20.7	21.0	21.3
95	SPH	*	*	*	*	*	*	9.16	14.7	16.7	18.7	19.4	20.2
100	SPH	*	*	*	*	*	*	7.11	12.6	14.6	16.6	17.8	19.0
105	SPH	*	*	*	*	*	*	5.06	10.6	12.6	14.6	16.2	17.9
110	SPH	*	*	*	*	*	*	*	8.55	11.3	14.0	16.1	18.3
115	SPH	*	*	*	*	*	*	*	6.50	9.98	13.5	16.1	18.6

LEGEND

Ewb — Entering Wet Bulb

SPH — Superheat at Compressor (F)

*Do not attempt to charge system under these conditions — refrigerant slugging may occur.

**Table 12 — Required Suction-Tube Temperature (F)
(Entering Suction Service Valve)**

SUPERHEAT TEMP (F)	SUCTION PRESSURE AT SERVICE PORT (Psig)								
	61.5	64.2	67.1	70.0	73.0	76.0	79.2	82.4	85.7
0	35	37	39	41	43	45	47	49	51
2	37	39	41	43	45	47	49	51	53
4	39	41	43	45	47	49	51	53	55
6	41	43	45	47	49	51	53	55	57
8	43	45	47	49	51	53	55	57	59
10	45	47	49	51	53	55	57	59	61
12	47	49	51	53	55	57	59	61	63
14	49	51	53	55	57	59	61	63	65
16	51	53	55	57	59	61	63	65	67
18	53	55	57	59	61	63	65	67	69
20	55	57	59	61	63	65	67	69	71
22	57	59	61	63	65	67	69	71	73
24	59	61	63	65	67	69	71	73	75
26	61	63	65	67	69	71	73	75	77
28	63	65	67	69	71	73	75	77	79
30	65	67	69	71	73	75	77	79	81
32	67	69	71	73	75	77	79	81	83
34	69	71	73	75	77	79	81	83	85
36	71	73	75	77	79	81	83	85	87
38	73	75	77	79	81	83	85	87	89
40	75	77	79	81	83	85	87	89	91

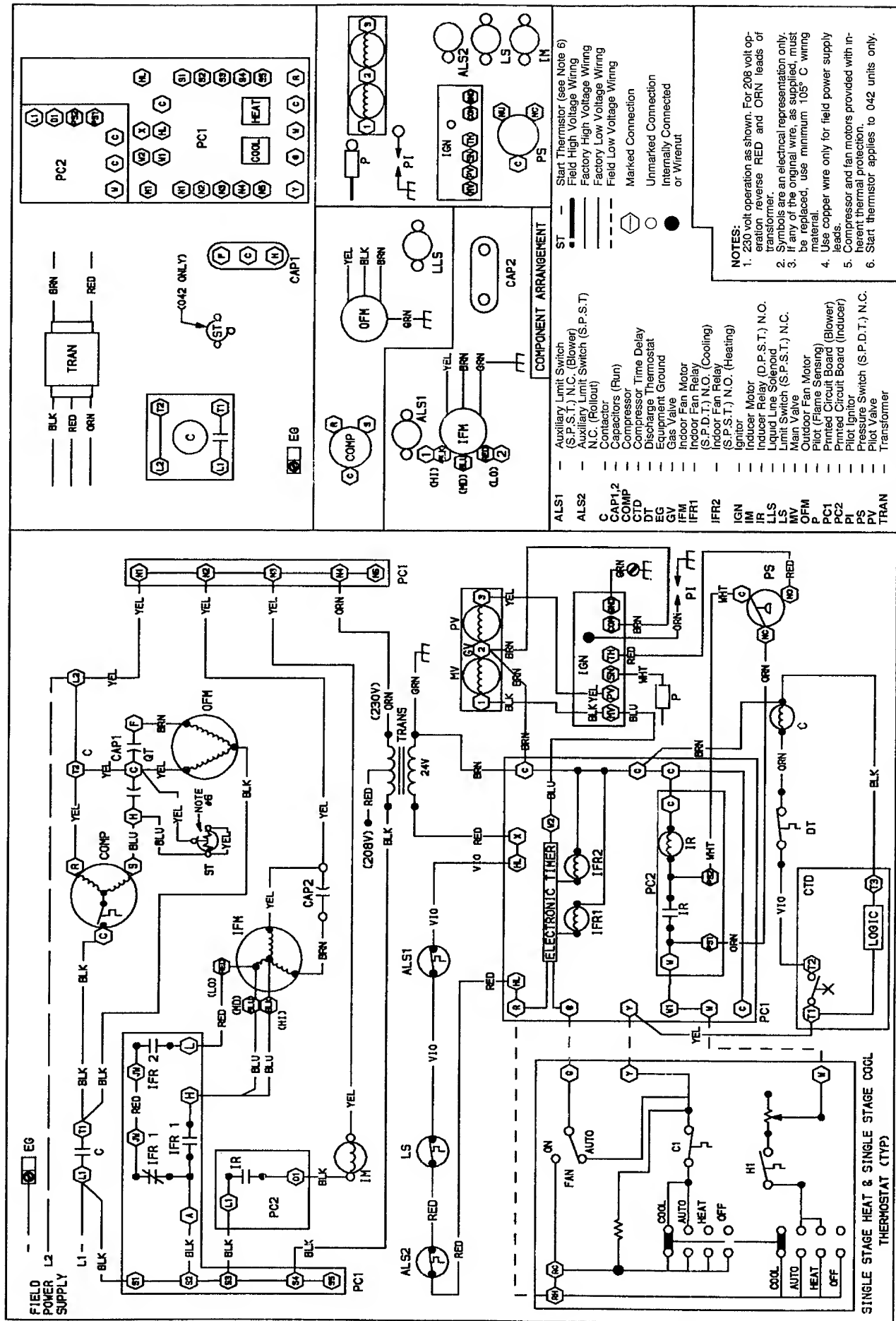
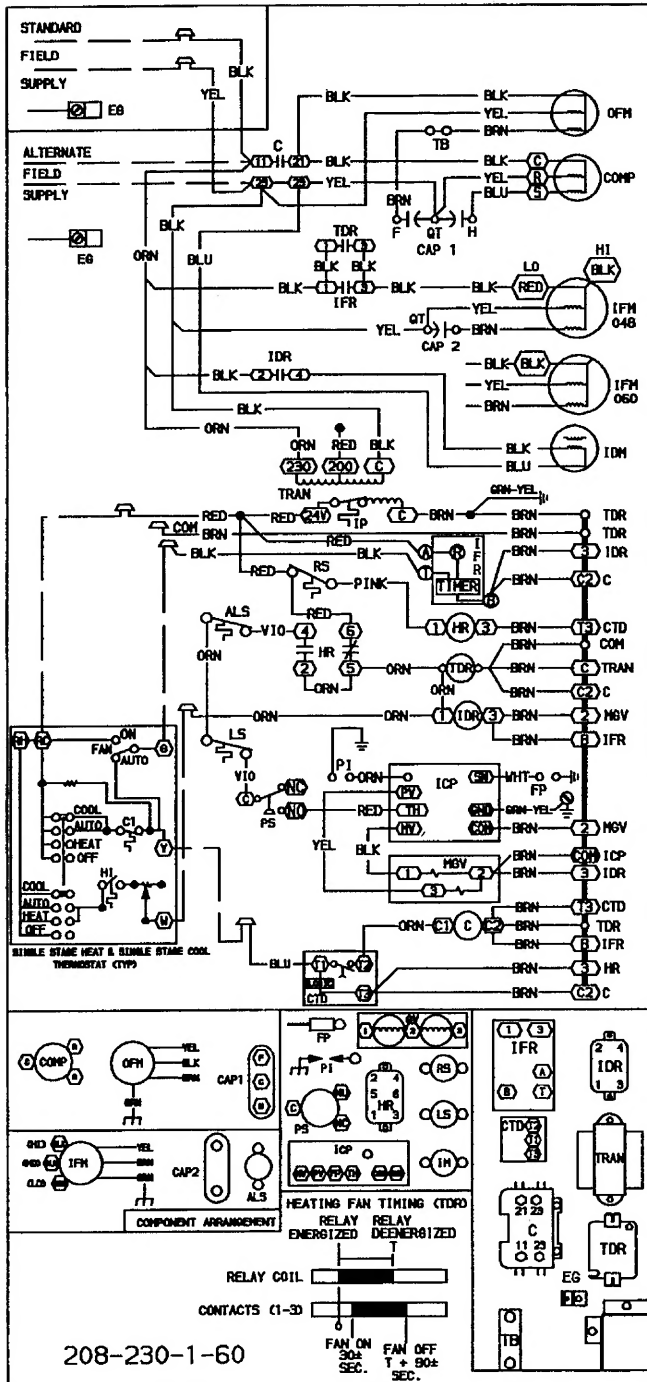


Fig. 21 — Typical 208/230-1-60 Wiring Diagram (Unit Sizes 024-042)



LEGEND

ALS	— Auxiliary Limit Switch (S P S T)
C	— Contactor
CAP 1,2	— Capacitors
CH	— Crankcase Heater
COMP	— Compressor
CTD	— Compressor Time Delay
EG	— Equipment Ground
FP	— Pilot (Flame Sensing)
GV	— Gas Valve
ICP	— Ignitor Control
IDR	— Induced Draft Relay (S.P.S.T.)
IDM	— Induced Draft Motor
IFM	— Indoor Fan Motor
IFR	— Indoor Fan Relay (S.P.S.T.)
IP	— Internal Protector (Auto Reset)
LS	— Limit Switch (S.P.S.T.)
MV	— Main Valve
OFM	— Outdoor Fan Motor
PI	— Pilot Ignitor
PS	— Pressure Switch (S.P.D.T.)
PV	— Pilot Valve
RS	— Rollout Switch (S.P.D.T.)
TB	— Terminal Block
TDR	— Time-Delay Relay (S P S T.)
TRAN	— Transformer

---	Field High Voltage Wiring
---	Factory High Voltage Wiring
---	Factory Low Voltage Wiring
---	Field Low Voltage Wiring
⬢	Marked Connection
○	Unmarked Connection
●	Internally Connected or Wirenut
⌒	Field Splice

NOTES:

1. 230-v operation as shown. For 208-v operation reverse RED and ORN leads of transformer.
2. Transformer has internal automatic reset overload
3. If any of the original wire as supplied must be replaced, use minimum 105 C wiring material.
4. Use copper wire only for field power supply leads.
5. Compressor and fan motors provided with inherent thermal protection.

Fig. 22 — Typical 208/230-1-60 Wiring Diagram (Unit Sizes 048,060)

TROUBLESHOOTING

Cooling

SYMPTOM	CAUSE	REMEDY
Compressor and condenser fan will not start.	Compressor is reenergized in less than 5 minutes	Wait for 5 minutes from the time that the compressor was deenergized.
	Power failure	Call power company.
	Fuse blown or circuit breaker tripped	Replace fuse or reset circuit breaker.
	Defective thermostat, contactor, transformer or control relay	Replace component
	Insufficient line voltage	Determine cause and correct.
	Incorrect or faulty wiring	Check wiring diagram and rewire correctly.
	Thermostat setting too high	Lower thermostat setting below room temperature.
Compressor will not start but condenser fan runs.	Faulty wiring or loose connections in compressor circuit	Check wiring and repair or replace.
	Compressor motor burner out, seized or internal overload open	Determine cause. Replace compressor.
	Defective capacitor or overload	Determine cause and replace.
Compressor cycles (other than normally satisfying thermostat).	Refrigerant overcharge or undercharge	Evacuate and reclaim refrigerant from system and recharge to nameplate.
	Defective compressor	Replace and determine cause.
	Insufficient line voltage	Determine cause and correct.
	Blocked condenser	Determine cause and correct.
	Defective capacitor or overload	Determine cause and replace.
	Defective thermostat	Replace thermostat
	Faulty condenser fan motor or capacitor	Replace
Compressor operates continuously.	Restriction in refrigerant system	Locate restriction and remove.
	Dirty air filter	Replace filter
	Unit undersized for load	Decrease load or increase unit size.
	Thermostat set too low	Reset thermostat.
	Low refrigerant charge	Locate leak, repair and recharge
	Air in system	Evacuate and reclaim refrigerant from system and recharge.
Excessive head pressure.	Condenser coil dirty or restricted	Clean coil or remove restriction.
	Dirty air filter	Replace filter
	Dirty condenser coil	Clean coil.
	Refrigerant overcharged	Remove and reclaim excess refrigerant.
	Air in system	Evacuate and reclaim refrigerant from system and recharge.
Head pressure too low.	Condenser air restricted or air short-cycling	Determine cause and correct.
	Low refrigerant charge	Check for leaks, repair and recharge
Excessive suction pressure.	Restriction in liquid tube	Remove restriction.
	High heat load	Check for source and eliminate.
Suction pressure too low.	Refrigerant overcharged	Remove and reclaim excess refrigerant.
	Dirty air filter	Replace filter.
	Low refrigerant charge	Check for leaks, repair and recharge.
	Metering device or low side restricted	Remove source of restriction.
	Insufficient evaporator airflow	Increase air quantity. Check filter — replace if necessary.
	Temperature too low in conditioned area	Reset thermostat
	Outdoor ambient below 45 °F (unit size 018), 55 F (unit sizes 024-042), or 40 F (unit sizes 048,060)	Install low-ambient kit.
	Field-installed filter drier restricted	Replace.

TROUBLESHOOTING

Heating

SYMPTOM	CAUSE	REMEDY
No heat.	LED is flashing	Look for problems external to the ignitor module.
	LED is glowing continuously	Replace IGN control.
	LED is off	Check for power to TH terminal of control.
Pilot will not light.	No spark at electrode	Check air gap between electrode tip and pilot target. Gap should be as shown in Fig 18 Readjust as necessary
		Clean moisture or dirt accumulation on electrode ceramic with cloth.
		Cracked ceramic — replace pilot electrode assembly
		Check for loose or broken wiring at and between electronic control head and electrode. Replace wire or tighten connection as necessary.
		Check fuses or circuit breaker to ensure voltage to unit
		Check for 24 v between TH and COM. If you read 24 v and above steps have been completed, replace electronic ignition control.
	Spark shorting out to main burner	Realign electrode tip away from main burner but maintain spark gap to pilot burner See Fig 18.
	No gas at pilot burner	Clean pilot orifice.
		Check inlet pressure to gas valve Recommended operating pressure 7-in. wg natural gas, 11-in. wg LP gas; 0.5 psig (13.6-in. wg) max. pressure.
Check for 24 v between terminals PV and COM. If you read 24 v and above steps have been completed, replace gas valve.		
Burners will not ignite.	Water in gas line	Drain — install water trap
	No power to furnace	Check power supply, fuses, wiring or circuit breaker.
	No 24-v power supply to control circuit	Check transformer — replace if necessary.
	Miswired or loose connections	Check all wiring and wirenut connections.
	Dirty pilot — yellow flame	Clean pilot orifice
	Pilot burning improperly — sharp blue flame	Replace pilot.
	Burned-out heat anticipator in thermostat	Replace thermostat.
	No gas at main burners	1. Check for 24 v between terminals MV and COM on control head If you read 24 v, replace gas valve portion of control head/gas valve assembly.
		2. If 24 v is not present, check flame sensor for cracked ceramic insulator or shorted sensor cable.
Broken thermostat wire	Run continuity check to locate break.	
Inadequate heating.	Dirty air filter	Clean or replace filter as necessary.
	Gas input to furnace too low	Check gas pressure at manifold. Clock gas meter for input. If too low, increase manifold pressure, or replace with correct orifices.
	Unit undersized for application	Replace with proper unit — or add additional unit.
	Restricted airflow	Clean or replace filter.
	Blower speed too low	Use faster speed tap — or install optional blower.
		Check temperature rise.
	Limit switch cycles main burners	Dirty air filters — clean or replace.
		Registers closed, restricted ductwork — open or remove restriction.
		Check temperature rise.
Check heat anticipator setting on thermostat — readjust.		
Poor flame characteristics (sooting flame or floating flame).	Incomplete combustion or lack of combustion air	Check all screws around flue outlets and burner compartment — tighten.
		Cracked heat exchanger — replace
		Overfired furnace — reduce input, or change orifices.
		Check vent for restriction — clean as required.
		Check orifice for burner alignment.

START-UP CHECKLIST
(Remove and Store in Job File)

I. PRELIMINARY INFORMATION

MODEL NO.: _____

SERIAL NO.: _____

DATE: _____

TECHNICIAN: _____

II. PRE-START-UP (insert checkmark in box as each item is completed)

- ☐ VERIFY THAT ALL PACKING MATERIALS HAVE BEEN REMOVED FROM UNIT
- ☐ REMOVE ALL SHIPPING HOLDDOWN BOLTS AND BRACKETS PER INSTALLATION INSTRUCTIONS
- ☐ VERIFY THAT CONDENSATE CONNECTION IS INSTALLED PER INSTALLATION INSTRUCTIONS
- ☐ CHECK ALL ELECTRICAL CONNECTIONS AND TERMINALS FOR TIGHTNESS
- ☐ CHECK GAS PIPING FOR LEAKS
- ☐ CHECK THAT INDOOR-AIR FILTER IS CLEAN AND IN PLACE
- ☐ VERIFY THAT UNIT INSTALLATION IS LEVEL
- ☐ CHECK FAN WHEEL AND PROPELLER FOR LOCATION IN HOUSING/ORIFICE AND SETSCREW TIGHTNESS

III. START-UP

ELECTRICAL

SUPPLY VOLTAGE L1-L2 _____

COMPRESSOR AMPS L1 _____ INDOOR FAN AMPS _____

TEMPERATURES

OUTDOOR-AIR TEMPERATURE _____ DB

RETURN-AIR TEMPERATURE _____ DB _____ WB

COOLING SUPPLY AIR _____

GAS HEAT SUPPLY AIR _____

PRESSURES

GAS INLET PRESSURE _____ IN. WG

GAS MANIFOLD PRESSURE _____ IN. WG

REFRIGERANT SUCTION _____ PSIG

REFRIGERANT DISCHARGE _____ PSIG

- ☐ VERIFY REFRIGERANT CHARGE USING CHARGING TABLES ON PAGES 28 and 29.

CUT ALONG DOTTED LINE